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REMINERALIZE THE EARTH

Regenerating our soils, forests and health

RECYCLING MINERALS with finely ground gravel and rock dust

ISSUE # 3 SPRING 1992 • NORTHERN HEMISPHERE

Regenerating Appalachian Forests
An Interview with Dr. Robert Bruck

How to Make Topsoil

Tips on Looking for Local Gravel Sources

Rock Dusts for Human Nutrition

***Men of the Trees* in Australia Gives Inspiring Report on Remineralization of Tree Seedlings**

FALL 1992 • SOUTHERN HEMISPHERE formerly SOIL REMINERALIZATION NEWSLETTER

REMINERALIZE THE EARTH

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Recycling minerals with finely ground gravel and rock dust

This magazine is a reflection, forum, round table of ideas, experiences and research of those concerned with networking and implementing soil remineralization. Articles, letters, and photos are welcome and appreciated. We reach an emerging grass roots community network around the world.

EDEN OR ICE AGE
Which Will We Choose?

The book *The Survival of Civilization* by John Hamaker and Don Weaver is regarded by a growing movement worldwide as a blueprint for the survival of the Earth, restoring ecological balance and, perhaps, even recreating Eden.

The remineralization of forests, farms, orchards and gardens with glacial gravel and rock dust is nature's way to regenerate and fertilize soils. During an Ice Age, as glaciers grind rock to a fine dust over millennia, a fertile soil is created. Adding finely ground gravel dust to soils is a tremendous boost to organic agriculture and can make it truly viable by adding up to a hundred elements and trace minerals needed by all life and by nourishing the microorganisms in the soil, whose protoplasm is the basis of all living things.

There is evidence to suggest that as forests begin to die off worldwide, giving off carbon dioxide, the climate of the Earth is altered, triggering the transition from the warm interglacial to an Ice Age. We are hastening this process with the burning of fossil fuels. Undertaking the task of remineralization is urgent to restore our agricultural soils and to save the dying forests in the temperate latitudes and stabilize our climate.

On the Cover:

Men of the Trees rock dust trials 1991. Nursery manager Monica Durcan compares the *E. gomphocela* seedlings grown with the rock dust soil amendment and inoculant with the control seedlings (right).

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◆ **The Men of the Trees** *page 8*
Soil Improvement in Western Australia
by *Barrie Oldfield*
From down under, the President of the WA chapter of The Men of the Trees files an inspiring report on nursery trials and field tests of granite rock dust on seedling trees. With arid climate, ancient weathered soils and decades of agricultural abuse, western Australia is a rough, challenging ecosystem to test the benefits of remin-eralization in a soil improvement program. Early results of these studies by The Men of the Trees are encouraging.

◆ **Regenerating Appalachian Forests** *page 14*
an interview with Dr. Robert Bruck
*The newly appointed Director of the Environment for North Carolina is a plant pathologist who has carefuly studied the decline and death of trees on Appalachian mountaintops. In 1991, with a new environmental organization called **EarthDance**, Dr. Bruck planted 5,000 seedlings on two dying mountains – currently the largest field test of rock dust on trees in the U.S.*

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*In central New York, Earthwise Education Center, a new environmental organization has begun to **Bring the People Back Home** – a project to transform urban homeless into rural homesteaders. Earthwise Education Center also recycles urban spoils into fertile soils. Last year Earthwise trainees learned the secret ingredient which turns infertile sand and a truckload of garbage into an explosion of squash.*

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Publisher/ Editor: *Joanna Campe* ◆ **Associate Editors:** *David Yarrow, Willow La Monte, and Janet Scott* ◆ **Layout:** *Joanna Campe, Willow LaMonte* ◆ **Regular Contributors:** *Don Weaver, Dan Hemenway, David H. Miller, David Yarrow* ◆ **Cover Design:** Willow LaMonte.

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Welcome to *Remineralize the Earth*

About and In This Issue

We regret the delay and are delighted to have this issue out at last! We were stalled by lack of assistance and computer software problems. I am very grateful to Janet Scott, Willow LaMonte, David Yarrow and Don Weaver, without whose dedication and contribution, this issue would not be in your hands right now. This issue reaches most of you at the beginning of the growing season with an updated gravel source list, with many new products available, and other timely information.

Remineralization trials are taking place on two continents:

In Australia there has been a breakthrough in SR trials for tree seedlings by Barrie Oldfield and *Men of the Trees* and a donation of $30,000 in rock dust and services from a local quarry.

We are pleased to bring you an interview with Dr. Robert Bruck of North Carolina State University. The EarthDance initiative, remineralization of tree seedlings on Grandfather Mountain, has already had dramatic and positive results in height growth and overall health versus the controls, and may soon expand to 50 acres.

David Yarrow and Dave Miller give practical advice, from making topsoils to the challenge of scouting for local sources of gravel dust. Biodynamic farmer and dowser Harvey Lisle makes a distinction writing about *living* rock dusts.

We were saddened by the passing of Edmundo Kandler in Costa Rica. I had the opportunity of meeting him four years ago at the *Intl. Union for the Conservation of Nature* conference in San Jose, Costa Rica. Undaunted by illness, he reached top officials and many others in Costa Rica. Remineralization would likely be underway except for econonic difficulties caused by the severe earthquake there a year ago.

Joanna Campe

Edmundo Kandler and Betsan Coats attending the I.U.C.N. conference in 1988.

Dreams Coming True and Visions for the Future

◆ Let's reach out to more gardeners and farmers with information about remineralization. The feature article "Now You Need Rocks In Your Bed" in *Organic Gardening* (May-June) has put remineralization in the limelight and reached many more gardeners.

◆ Help us envision an international gathering of SR advocates, researchers and policy makers aiming to publish papers and with strategies and plans for getting SR underway, locally and globally.

◆ Let's develop more cooperative and sustainable local businesses based on SR – an exponential increase in SR networking and actions everywhere. Please share your aspirations and actions locally, regionally and globally, so we can manifest our dreams into reality together – a symphony for a remineralized Earth!

We may have exciting news and a breakthrough in a coming issue – a national aggregate association may be researching remineralization and doing feasibility studies for creating gravel dust products for agriculture and forestry within their industry.

Joanna Campe

In Memoriam
Edmundo Kandler
1924-1991

Farewell, Edmundo. We thank you for your valiant advocating and efforts over many years to get remineralization underway in Costa Rica, setting a strong foundation stone for the future. And for your life-long contributions to Earth regeneration and peace in your country. As he wrote in a letter to the Costa Rican-born astronaut Dr. Franklin Chang, "Costa Rica ...for so many reasons, is the ideal place to start a pilot plan, [for remineralization] a research and practical application, and then furnish to the world the results."

LOOKING FROM THE OTHER SIDE

by Walt Zmed

The winds of change on the economic landscape are becoming more prevalent every day. Futurists predict this is not a temporary turbulence of a tempestuous economy, but a climatic change of lasting effect. Looking in the eye of the storm of one such weather engine named "environmental issues", we can see it gain strength and velocity. It manifests itself in the many changes it causes in industry and agriculture in terms of economic hardships and difficulty in adaptation to strict standards. Such issues are becoming more verbal in the political arena worldwide where the catalytic process takes place which effects these changes.

A company stays afloat effortlessly and progresses in a favorable economic climate like a hot air balloon in fair weather. As the weather changes and the balloon begins to sink, ballast has to be shed in order to stay afloat. In the real world this may take the form of employee reductions. When conditions get severe enough, things that were once assets also have to go in order to survive. It's no surprise then, that most business leaders look upon such economic change-causing factors in a negative way. But that's looking at it from the inside out. Given this perspective, it is difficult to see such changes as economic opportunities as well.

Environmental pressures will continue to be a driving force in the times ahead. The entire world is in the process of paradigm shifts in all aspects of the industrial complex and agricultural practices. Droughts, violent storms, floods, extremes in temperature fluctuations are some of the signs of climatic changes on the terrestial landscape.

However, the most dramatic change that is occurring which will have the greatest effect, cannot be measured by a weather instrument or any other scientific device. The change that is occurring is happening in the minds of men, women and children around the globe. We are at an unprecedented time in the history of humanity. This generation has to make the decisions which will determine whether the earth will be habitable for the generations which will follow.

EARTH SUMMIT

The United Nations Conference on Environment and Development (UNCED) will take place in Rio de Janeiro, Brazil, June 1-12, 1992 The world leaders of over 150 countries will attend this most important conference to plan the necessary changes required to ensure a sustainable future for this planet.

Dr. Gary Herbertson, Director of Earth Summit Support Project, tells me that they have been collecting data to supply solutions for some of the problems being discussed at The Summit. In a conversation with Dr. Herbertson, I mentioned the use of pulverized gravel to remineralize soils, its ecologically sound properties and economic sense. He responded with interest, and indicated that these are the kind of data being collected for providing solutions to the problems to be addressed at The Summit. In agriculture, pulverized gravel, or *rock dust*, is a material which adequately fills the new model requirements of "environment friendly" and is capable of displacing much of the chemical use now dominating the agricultural market.

The current use of rock dust in the U.S. is negligible on total scale comparison. Although there are many obstacles in bringing it to end users, the most obvious ones are lack of awareness of the use of rock dust, acceptance by both the user and the scientific establishment, and lastly, the ability to produce and deliver a product in sufficient quantities to the vast market.

The current production rate from the various individuals and small cottage industries may be enough to prime the pump, but the quantity needed is tremendous, to say the least. In time these small producers will grow, but do we have that luxury of time?

There is an industry out there which, with some minor modification in tooling and procedures, can meet the required needs. My own personal involvement with rock dust production has been with a company by the name of Livingston-Graham. They are one of the largest rock products producers in the country, with 3.5 million tons per year at peak production.

Most companies will listen to a good business proposal, especially during these lean economic times. Some industries are involved in a process commonly known as "economic conversion", such as the suffering aerospace industry, which is considering producing electric cars using its existing skilled manpower and machinery. At Livingston-Graham the conversion was from supplying only the construction industry, to now include agriculture as well, using the same raw material but in a different form. Producing the rock dust is perhaps the easiest of the obstacles to overcome; to create a market is considerably more difficult.

Those who are involved with rock dust, in one way or another, know of its wonderful properties and its effectiveness on vegetation, but public awareness lags far behind. Perhaps it is time again to stimulate the catalytic juices in the political arena so changes can take place more quickly to reshape industry so that it can facilitate the needs of a sustainable world.

***Walt Zmed** is an engineer and Director of New Product Development for Livingston-Graham, a sand and gravel operation located near Los Angeles. Concerned with environmental and social responsibilities of science, technology and industry, he is an active member of the World Future Society, an international organization interested in alternative futures. He is a founding member of the Telesinstitute – a futurist study group of southern California. An avid gardener, he is ready to discuss the various aspects of it at the drop of a hoe.*

A BRIEF PERSPECTIVE
On Soil Remineralization and the Climate

Soil Remineralization

The soils of the entire world have become severely demineralized by erosion over thousands of years. Plants require a continuous intake of minerals, just as we do, and for very similar reasons – calcium to build structural support, iron to carry oxygen, and so on. Plants growing on mineral-depleted soil do not get enough nourishment and so become smaller, less-abundant and less hardy, more vulnerable to the insects, worms and fungi they are prey to.

Remineralization causes a phenomenal growth of the microorganisms in the soil. It increases the nutrient intake of plants. It counters the effects of soil acidity, prevents soil erosion (just for that reason it would be worth applying rock dust), increases the storage capacity of the soil, contributes to the building of precious humus complexes, has anti-fungal properties, and when you spray it on plants it repels insects as well. The plants and trees become highly resistant to insects, disease, frosts, and drought. Remineralization also enhances and speeds up the process of composting, so if you're composting for your garden, consider putting on some rock dust. It can be even more effective than just directly applying it to the land.

For Forests

The results of long term experiments released in 1986 showed that *in a forest where pine seedlings were remineralized, after 24 years the wood volume was four times higher* than in the untreated area.

For Agriculture

The best source of soil minerals is simple crushed gravel dust. In 1976 John Hamaker spread gravel crusher screenings on part of his ten acres in Michigan. The following year, in an area of sparse rainfall and dry summers, *and with no irrigation,* his corn produced 65 bushels per acre, compared to yields of under 25 from other local farms.

Moreover, when independent analyses were done, Hamaker's corn was found to contain 28% more protein, 47% more calcium, 57% more phosphorous, 60% more magnesium and 90% more potassium than the same type of corn grown with chemical fertilizers nearby.

Twenty years ago the USDA published studies which showed that cement kiln dust (a less satisfactory source of minerals) also produced better crops, but they couldn't understand "what element" in the dust was responsible and dropped the matter.

Don Weaver grew 18-foot pole beans on remineralized soil (Jack and the Beanstalk?) and got *two to four times the normal organically grown yield.* Alan LePage of Vermont grew a crop of carrots averaging 1-1/2 feet long. And there was no insect damage to any of these crops.

Hamaker estimates that on fully remineralized soil, American agriculture could grow *four times* as much food as it is capable of now – or the same amount of food at about one-fourth the cost – and with no pesticides or chemical fertilizers.

The Nutritional Aspect

When we eat food grown on depleted soil we too, like the plants, lose our natural resistance to disease. All the degenerative diseases have been on the rise in America in recent decades. Dietary fat, cholesterol, salt and overly-refined foods seem to be major factors, but a serious deficiency of minerals in our food may be another. Mineral depletion of soils has been found to be directly correlated with death rates. And deficiencies of only one of a number of trace minerals-- copper, iron, selenium, etc. -- have been found in laboratory studies to be associated with an increased risk of cancer. You may want to grow more complete, nourishing food for yourself and your family.

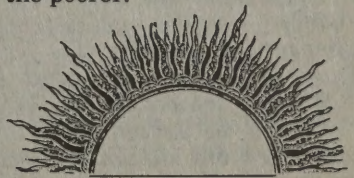
A Global Perspective On Climate

The problem of soil demineralization also has a global perspective. It is known that the Earth's soil becomes demineralized during each interglacial period, the relatively short 10,000- year warm period between each 90,000-year major Ice Age. Consequent decline and death of the world's forests and other vegetation which occurs causes great quantities of carbon dioxide to be given off. The level of carbon dioxide in the Earth's atmosphere has been rising exponentially for the past century. Carbon dioxide and other greenhouse gases trap excess heat from the sun, potentially affecting the world's climate.

It is also well-known that when the glaciers advance and then recede during each recurrent Ice Age, they grind down rocks in their path, and that their mineral-rich dust is blown far and wide over the surface of Earth, remineralizing its soil and causing plant life to thrive again.

John Hamaker has supplied one missing piece of a cosmic puzzle to provide an explanation, long sought, of the awesome 100,000-year cycle of major Ice Ages. Hamaker points out that the greenhouse effect occurs primarily in the tropics, which get the most sun, rather than in the polar regions which get very little. When this happens, the temperature differential between the tropics and the poles increases, resulting in fierce wind systems, hurricanes, tornadoes and storms.

The moisture picked up by these increasing storm systems also is transported to the higher latitudes, where it gets deposited as snow and ice,. eventually bringing on glaciation and the next Ice Age. This has been happening in recent years, with record snow cover in the Northern Hemisphere and a shortening of the growing season, by weeks in some places, a pattern which is also accelerating year by year. Hamaker estimates that within a few decades the growing season may have decreased so much that millions of people will starve, in the richer nations as well as the poorer.



The above information is condensed from the writings of John Hamaker, Don Weaver, Larry Ephron and Joanna Campe.

A Rock Dust Primer

◆ Hamaker quotes and gems

Approximate Application Rate Conversions

3 tons per acre	=	14 lb. per 100 sq. ft.	=	1.25 lb. per sq. yd.
10 tons per acre	=	46 lb. per 100 sq. ft.	=	4 lb. per sq. yd.
20 tons per acre	=	92 lb. per sq. ft.	=	8 lb. per sq. yd.

What Type of Rock Is Best?

Feeding poor soil with mixed rock dust may be compared to feeding an ill person a varied diet of unrefined, natural food. If no one single food is a panacea, it might follow that no single rock type is "ideal". Indeed, the virtue of glacial gravel is said to lie in its broad spectrum of rock types. Hamaker advocates the use of glacial gravel dust, ideally followed by river and seashore gravels and mixtures of single rock types.

John Hamaker in the book *The Survival of Civilization* suggests finely ground glacial gravel because that is nature's way throughout millennia to create fertile soils. Glacial gravel, which is a natural mixture of rocks, will create a broad spectrum of minerals in the soil in a natural balance.

Much of value can be gleaned from Europe and the research and experiences there (where single rock types and combinations of single rock types are used.) Hamaker's approach, however, may very well offer an even greater potential for an ecologically sustainable and sound agriculture and forestry.

Does It Need To Be a Special Kind of Gravel?

Again, the analogy of feeding soils to feeding humans is pertinent. From simplistic notions of human dietary requirements as straight protein-fat-carbohydrate ratios, our understanding of specific human dietary needs has grown to staggering sophistication and complexity, and we are now learning that what we don't know may exceed what we do. Similarly, we have come a long way from the simple NPK idea. But no amount of controlled research has conclusively told us (or likely will ever tell us) precisely which minerals specific plants really need and in what precise proportion. The attempt to second-guess nature in all her complexity is sure to be a futile and perpetual game of catchup.

Hamaker asserts that:

"Microorganisms select what they need to make the compounds of life, and reject to the subsoil what is not needed, [such as] aluminum, silicon, iron, etc., which are generally in excess [in gravel dust]," further pointing to "the Kervran research on biological transmutations", which suggests that biological organisms may play an active role not only in selecting specific elements, but also in modulating their elemental nature to create needed materials where they are in short supply. Hamaker says:

As long as the soil is neutral [in pH] or close to it, microorganisms will control what goes into the plant roots. These controls are off when the soil is acid or acidic chemicals are added.

Composting With Rock Dust

Combining gravel dust with organic materials in compost is a great way to solve application problems and speed up the process. Don't forget a handful of soil to innoculate with organisms. Gravel dust improves aeration and structure and therefore prevents rotting. Gravel dust is assimilated even more quickly in compost than in poor soils.

Compost and gravel dust are a symbiotic combination: the compost provides an excellent medium for the "microorganism population explosion" promoted by the dust, and the gravel dust will not only help create more organic matter, but will also help hold it in place, reduce odors and conserve it.

Add 2-20 lb. of rock dust per cubic yard of compost, if one is doing pile or windrow composting.

Soil Acidity

Soil pH should be measured annually. If the soil is acidic, agricultural limestone may be added together with the rock dust to bring the soil pH to neutral. Gravel dust will also neutralize soils to a great degree, but limestone is a quick remedy for agricultural soils. Limestone is not recommended for forests as it will destroy the humus-building complex over the long term.

Keep Insects In Natural Balance In Your Garden

For short term rescue, very fine dust sprayed directly on plants and trees has been shown in research in Germany to deter insect infestations very effectively. Trails of rock dust around the garden help keep slugs out. And healthy remineralized plants will not be plagued by insect infestations in the long term.

How To Apply Gravel Dust

There are many ways to apply dust to the soil; which method you use depends on the scale and your preference. It can be spread by hand out of a wheelbarrow, or roto-tilled and disked in. Farmer John Sundquist applies it with a manure spreader, bander or an "E-Z Flow"-type fertilizer applicator. He also uses rock dust in a potting soil made of compost, ashes and peat moss.

How Much To Use

◆ *A grower of crops or a gardener needs a good response the first year after a fall application. The response in any one year depends on the amount of minerals available to the microorganisms, soil moisture and the amount of inert organic matter.*

◆ *If the last two factors are satisfactory, as little as 3 tons of gravel dust per acre worked into the top 4 inches of soil should give good results. However, I prefer about 10 tons per acre worked in about 8 inches, since one application will eliminate the cost of a number of more frequent applications and give high yields.*

The Application Conversion chart above will help you to determine how much gravel dust to use: 3 tons per acre is considered the minimum application, 10 tons per acre is Hamaker's preferred long-term application, and 20 tons per acre is given as a major remedial application, for especially dry, poor soil. Smaller amounts are recommended if the rock dust is finer than 200 mesh.

Finding Local Gravel Dust

To find Gravel grinding operations in your area, call your local gravel pit (look in the *Yellow Pages* under Cement-Wholesale, or Sand and Gravel) and ask if they have crushed

Particle Size Conversion

Particle	Diameter (microns)	"Mesh"
Fine sand	250 – 100	50 – 125
Very fine sand	100 – 50	125 – 250
Silt	50 – 2	250 – 6000
Clay	2 or less	6000 or more

gravel screenings made from mixed rocks, the kind that comes out of river beds – crushed and passed through a 1/4 inch or finer screen. The gravel dust will probably cost from $1– $8.00 per ton plus the cost of transportation if the gravel pit delivers it to your garden. As most of the cost is in transporting the rock dust, having a truck or access to one is an advantage. A cooperative initiative with friends and neighbors would also cut costs down.

The Particle Conversion Chart shows various categories of "soil separates" (ground particles) listed with their diameters in microns (thousandths of a mm.) and their corresponding screen mesh sizes. "Mesh" simply refers to a screen with a given number of holes per inch.

The more finely ground the rock, the more readily microorganisms will have access to the minerals. John Hamaker uses the term "gravel dust" to mean a dust "90% of which will pass through a 200 mesh screen".

Testing Your Gravel Dust

◆ *Several people have reported to me that gravel dust does not work or it will have [only] a temporary effect. The don't describe the dust in detail, but I suspect they had very little dust in what they call 'dust'. Know what you are buying or you may be badly disappointed."*

Here are three simple, quick tests you can perform at home:

Pot Test: A pot test will give you immediate, practical proof of what the product will do in the soil. It is a good idea to add the gravel dust to clay pots and plant radishes or other fast growing plants and observe their progress. As John Hamaker writes,

◆ *Doing a pot test is the most convincing argument I know of. Anybody can do it. There are testing laboratory grinders everywhere. There is no lag time. In 6 hours you can get a microorganism population explosion. Taking some 6" clay pots, I filled them with a 50-50 mixture of earth and peat and 3 heaped tablespoons of dust. The results were astonishing!*

You can compare different mixtures or samples of gravel dust depending on what's available in your area. Use a control without rock dust to compare as well. You can also begin with small plots in the garden. You can see the results of the gravel dust you've chosen and then add it in larger quantities to your garden. Work the gravel dust into the topsoil, if possible.

Separate Layer Test: Purchasing a product based on its stated screen mesh alone still leaves room for error. A purchase of 90% or even 100% 200-mesh screenings could contain only sand and silt, and no true dust. A separate layer test will tell you approximately how much of your "dust" is really dust and will be suspended in water.

Fill a clear glass half full with your sample and cover it with about two inches of water. Shake it up vigorously, then allow it to settle overnight. The dust, silt and sand will settle into three distinct layers with the dust at the top.

If the container is allowed to stand until the water has dried out, the dust [topmost] layer will shrink to about 1/3 the original measurement and give a more accurate percentage of the dust. Your first observation, however, will tell you if you are buying mostly sand. The coarser the grind, the less effective it will be in the soil, and the more you will need to use per acre.

Moisture Test:

◆ *If the material is bought by the yard, there is a probable increase in bulk when wet...The buyer needs to test so one can know the actual weight of dust one is applying to the land.*

Take a sample, weigh it, then dry it thoroughly in the oven [and re-weigh it]. This will tell you how much of the weight you are buying is moisture.

Chemical Analysis

In most situations, having a formal chemical analysis made is probably going to unnecessary trouble. A pot test and small-scale trials with fast-growing plants will give you more accurate information and with less expense. In cases where you have doubt about its source, you may wish to have a gravel dust analyzed to ensure that it is free of radioactive elements and toxic industrial by-products. In most cases your source will have already had to undergo such testing in order to get a license to operate. This is worth some homework. If you are not able to obtain documentation to your satisfaction, it might be wise to go ahead and obtain your own independent lab tests. A good testing lab is listed in the *Gravel Sources* section on page 42.

More Tips From Hamaker

◆ *One other thing might be useful. I put about 2 inches of sand on our garden before plowing. It will last a long time and give some yield after the dust is used up. I am sure it has been contributing to what we grow. Unscreened sand (preferably fine sand) from a local gravel pit is much more economical than shipping dust which is mostly silt and fine sand.*

◆ *Sometimes the gravel pits have mesh screens and can measure the exact fineness of the gravel. Though it may be hard to find the ideal fineness – 90% passing through a 200-mesh screen – it may be practical to use even if only 20% or so passes through a 200-mesh screen and at least 50% passes through a 100-mesh screen. You will have the finer material immediately available to the soil and the rest will break down over time. If most of it passes through a 200 mesh screen, it will have a fine consistency like flour or cement. The gravel pit may have machinery to crush the rock finer and may crush it for you.*

Soil erosion is an effect of the shortage of minerals available to support the soil organisms. As Hamaker says,

◆ *That shortage can be made up on any piece of land in the time it takes to work ground gravel dust into the topsoil. When that is done, the soil microorganisms begin to multiply and it is they who prevent soil erosion by granulating the soil and holding it against both wind and rain.*

We would like to know what results you get from remineralized soil, so that we can improve our knowledge and data-base. Please call or write us. Photos with written reports are welcome and an important contribution to our network. Thank You!

SOIL IMPROVEMENT
THE STEP BEYOND CONSERVATION

by Barrie Oldfield

Western Australia is semi-arid, with annual rainfall on the same order as Africa's Sahel. Our soils are ancient – many millions of years old. Ages of weathering and leaching, and a few decades of farming with soluble NPK fertilizers, have left them impoverished. Today, despite the greatest care, each year large tracts of land are lost to salt and wind erosion.

Shelterbelts of trees are indispensable allies in an effort to reverse this loss of farmland, and to anchor a regeneration of the soil. Significant forest cover can eventually stabilize the local climate, too. The Western Australia chapter s dedicated to this task.

In 1989 we reviewed Julius Hensel's 100-year old work on natural soil formation using "stone meal" – finely ground rock powders. In 1991 they conducted nursery trials on four species of tree seedlings treated with granite dust and earthworm castings. Results were so encouraging, we have begun remineralization field trials on 23 hectares.

A new phrase has entered the conversation of *The Men of The Trees* in Western Australia: "Soil Improvement."

Whilst Australia is talking about "Landcare" and "Soil Conservation," this dirt-under-the-fingernails society is already working towards the idea that we have to do much better than simply protect the soils of our land. We have to start rebuilding them – rejuvenating them – making them infinitely more vital than they were even before white man came to *Terra Australis Incognita* and cleared the bush to grow crops. And that is a very different matter indeed.

For millions of years, Australia's soils have been exposed to the processes of degradation: weathering, leaching, eroding. This fact is borne out in the agricultural production figures. While we pride ourselves on our efficiency measured in terms of tonnage production per man on the land, our output in terms of tonnes per hectare is among the lowest in the world. This is so despite the skill of our agronomists and levels of fertiliser input our farmers use to grow crops.

Neither is there any question that our farming methods have hastened the decline of our soils. Hence the national concern and implementation of measures, both state and federal, to slow down the degradation process.

What we have not done, to any unified extent, is to rebuild soils as an industry of value in itself. Any soil improvements have been undertaken simply to improve yields of the next season's crop, or, at the most to ensure the viability of the farm a few more years. Always the motivation for our work has been the *profit* of agriculture, never for the *benefit for seven generations,* as wiser societies before us believed.

Stumbling Behind the Plough

My life in farming began in England in the 1940s. In those immediate post-war days there were shortages of everything, tractor parts, fuel, food. But we still had the horses – two in fact. And the old horse-drawn implements, three ploughs and a harrow, were still on the farm buried in a thicket of nettles.

For a few years we ploughed and harrowed, sowed and weeded, cultivated and harvested just as it had been done for hundreds of years previously. This wasn't some Amish peasantry, an organic cult. This was real, everyday farming practised under the constraints of an England emerging from a terrible war. There is no denying that what we did was out of necessity; it was hard work.

But I can tell you this: when you stumble along hanging onto the handles of a horse-drawn plough, one foot in the furrow, the other on the clod, you get a totally different perspective of the land you are working. The plough is in front of you. The freshly cut Earth is right there beneath your feet. Every yard of furrow reveals to you its needs, whether of manure, drainage, or special care.

Soils: Ancient and Modern

My first experience of gibber desert was when travelling the road from Amman to Baghdad in 1963. For mile upon mile the land on either side of the road, as far as the eye could see, was paved with stones. It was like crazy paving. The stones, much of an even size, were laid edge to edge. I thought at the time they had been laid by hand. After all, an Englishman's expectation of a desert is an undulating landscape of sand dunes. So perhaps an autocratic emperor ordered laying of the stones to stabilise the sand.

Years later a scene from *Lawrence of Arabia* vividly recalled for me that desert road. There were the same stones. Camels were crossing this land. The camera showed in close-up how terribly difficult it is to walk.

Then, many years and many adventures later, I met this remarkable man – Richard St. Barbe Baker, the founder of *The Men of The Trees.* He came to Western Australia to tell us about how the whole world is rapidly turning to desert under the impact of humanity. He told about the annual growth of the Sahara Desert, the dust bowl of the U.S., forest clearing in the

"... it is doubtful many of our native plants can cope with the now degraded countryside we left after our heavy footsteps, machinery and chemicals abandoned the land. I believe we now have a challenge. We have to start to rebuild our soil as an object of value in itself."

catchment of the River Platte, the failure of so much of our won land in Australia. But he brought news of hope also.

He showed how, when it was explained to them, the Moran warriors of northern Kenya banded together to grow trees and plant new forests as a bulwark against the growing desert. Their work, begun in 1922, has long since grown to a stable, prosperous forest supporting a peaceful community. They were the first 'Watu wa Miti' – *The Men of the Trees.*

He told the great story of his encounter with Franklin Delano Roosevelt in 1931 when he was Governor of New York State, and how plans were formulated so that when Roosevelt became President of the U.S. in 1933, the great Civilian Conservation Corps came into being within three months. This great work over an eight-year period gave six million people employment – worthwhile work to do – and successfully combatted the great land degradation problems which arose with broad acre farming of the mid-west – the Dust Bowl.

He showed us how 30 countries surrounding the Sahara desert had formed an alliance against the desert. He showed the tangible results of their fight against the common enemy: desertification. Huge olive plantations in Libya, great forests in southern Algeria (so many *Eucalyptus camaldulensis* were planted here they renamed it *Eucalyptus algeriensis*). Then the most impressive works of desert reclamation of all in Israel, where the people felt such a strong sense of identity with their land.

Most poignant of all, he showed us how Australia had suffered from colonisation. How we'd over-exploited the vast acreages we had, and how, if we wished to continue to live in harmony with the land, its soil and resources, we had to study the native vegetation and how it had adapted and survived. In short, he stimulated that submerged conscience within us to become active in restoring the vegetation, without which soil would die and our future become unthinkable.

We founded the Western Australia Branch of *The Men of The Trees* there and then. It was 1979.

Tree Planting

One of the most important and popular land conservation treatments is the strategic planting of trees. Considerable strides have been made in theory and practice in the past ten years, and it would be fair to assume that most Australians are now aware of the physical benefits of trees in the landscape. On this matter most farmers and conservationists are united.

The Men of The Trees' main focus is the great wheatbelt region stretching from Geraldton to Esperance. With over 1000 members, this uniquely dedicated group is now providing volunteers and a quarter of a million trees grown annually in its own nursery at Hazelmere to help country communities shelter their land.

It would be true to say that while the world is full of people talking about the need for more trees, *The Men of The Trees* just go out and plant them.

However, it was the result of many journeys — of many practical hours spent tree planting in hostile environments — that drove members of this society to work even harder for landcare. When you have dedicated a large amount of your voluntary time and money to caring for your nation's land; when you have experienced the weeds, the mud, biting winds, the frugal comforts of a shearing shed floor, or a tent for the night; when your mattock rebounds from the concrete-like Earth and locust swarms emerge from the soil to devour everything green in sight, including your newly planted trees — then, and only then, does the mind become wonderfully focused.

There was a great gap between what we were doing and what we needed to be doing. The soils themselves were seen to be in a profoundly impoverished condition. Take a handful of wheatfield soil, for instance, compare it to that under your own cabbage patch, and there is no question that it lacks everything a good soil should have: minerals, humus, structure, "life" itself. Applying superphosphate and urea certainly provide instant soluble fertilisers to grow the crop, but it treats wheat growing as a hydroponic operation. Many things are lacking, the absence of which severely retards plant growth.

Trees are also plants. They, too, benefit enormously when their Earth environment is enhanced, and a thrifty tree that grows to head height in one season is a better tree, all its life, than one that struggles against every imposition of Earth and Man.

And so, through a long process of enquiry and practical field trials on small plots throughout the wheatbelt, the potential benefits of soil rejuvenation began to appear.

Rock Dust: Remineralisation

In March 1989 I visited the Island of Nauru to make a film with TV Ecologist David Bellamy. Of course our conversations ranged widely over the management of the Earth's resources, the practice of the Law of Return, the need of humanity for the products of a healthy biosphere, and the interdependence of all life, including ours, and on the protection of natural living systems.

On the night we arrived back in Melbourne I had arranged to meet with Vernon G. Lawrence, AM of Hawthorn. Vern Lawrence, a retired farmer, publishes an occasional newsletter, *Humus and Rock.* I was al-

Men of the Trees Rock Dust Trials 1991, top growth of Eucalyptus gomphocephala at 5 1/2 months grown with 20t/ha dust and innoculant incorporated into the potting mix, compared with the control.

When we have those soils as resilient to walk on as the floor of a forest, when we have earthworms as our indicators, then we shall be approaching our reward.

ready aware of much of the literature on remineralisation and had been in contact by correspondence and telephone with both Lawrence and Betsan Coat of Alexandra Headland, Queensland, who spends her climax years travelling the world preaching remineralisation.

In the course of our conversation that evening I realised that, whilst much had been written on the subject and several scattered individuals had demonstrated local results, no real large scale, broadly based work had been undertaken. Still less, no scientifically based field trials had been conducted and reported upon.

It was then that I felt *The Men of The Trees* had a clear run – a promising avenue of research that pointed to a healthier soil environment for the better establishment of trees. Furthermore, soil rejuvenation would have implications for the whole farming industry, in particular diversification through new crops and management techniques, including agroforestry in its broadest sense.

Rock Dust Trial Results

Two seasons of trials were conducted on a broadly scattered basis. Approximately 70 people, most of them living close to Perth, undertook to dedicate a four-meter squared plot to the research. In addition, two students of biology at Curtin University, working under the direction of Dr. John Fox, did some quantitative field trials. At the end of the two seasons results were somewhat inconclusive, yet a golden thread was emerging which became the guide for a limited trial at *The Men of The Trees* nursery, St. Barbe Grove, in Hazelmere.

The results were outstanding. In seven weeks beneficial results were clearly seen. Press and television news followed, and many enquiries were received. The pathway to further broadscale field trials opened up. In close succession came the opportunity to take 23 hectares of typical wheat-growing country at Dowerin on a ten-year lease, followed by a remarkable response from home and overseas.

Then came the first substantial backing from Pioneer Quarries, who was among those supplying initial samples of granite rock dust. While being unable to support the venture financially they have made verbal commitment to supplying 400 tonnes of granite dust to specification, 600 tonnes of road base material, and a bulldozer for the essential metre-deep ripping before planting. A total commitment in materials and services to the value of $30,000.

Interpreting Results

I believe that the benefit of rock dust is a "frontier" effect rather than a direct weight-for-weight equation as one might expect with a soluble fertiliser. The dust creates a large surface of freshly cut granite which seems to encourage the vigour of soil micro-organisms. That is simply the theory. There is much detailed analytical work to be done and we can only open the doors to new research.

Nevertheless, our observations are based upon actually doing the work in soils with living plants – and with "dirt under the fingernails". I further believe the most important factors are:

a) the fineness of the dust particles is more important than the actual mass of the dust material.

b) their dispersion through the soil and proximity to the humus which is the other life-building factor is paramount to their effectiveness.

With dust of which 61.9% has a particle size of 75 microns or less, the beneficial plateau in our trials seemed to be in the region of 15-20 tonnes/hectare. At 12 tonnes/hectare the plant growth was markedly inferior.

The 'Golden Thread' also indicated that the soil should be inoculated with a population of micro-organisms to stimulate the fast return to what should be a natural living community. Again, this proved so in the nursery trial, though circumstances prevented the actual quantification of the results. (We were, after all, growing tree seedlings to plant out in the country, not growing them to be killed, dried and weighed in a laboratory!)

Implications for Native Plants

Many times I've returned to sites of our former tree plantings. While we give tree seedlings the very best start possible – deep ripping, fertilisation, weed control – the most vigorous growth occurs where the soil still retains something of its former self. Soil is a very complex material, and its constituents and their arrangement are as a result of this force we call "life."

An early indication remineralisation might work for natural regrowth was seen on the site of an old metal dump at Nukarni. Again, this was just one of those fragments one stores away in the mind in case it should connect with future experience.

So, while our native plants have shown remarkable adaptation to our ancient soils, it is doubtful in my mind whether many of them can cope with the now degraded country we have left for them after our heavy footsteps, our machinery and our chemical inputs have abandoned the land. I believe we now have a challenge. We have to start to rebuild our soil as an object of value in itself.

The Next Year

From March 1992 *The Men of The Trees* will be leasing 23 hectares at Dowerin to extend the rock dust trials into a typical wheat-growing and soil degrading environment. Our focus will be on soil building and agroforestry. When we have those soils as resilient to walk on as the floor of a forest, when we have earthworms as our indicators, then we shall be approaching our reward.

It is a great challenge, and one that will tax the resources of this voluntary society to the limit. Yet that is what we thrive on. Many mysteries about funding, plant materials, accommodation, fencing, rock dust, fertiliser and compost supplies will be solved. At the moment it's a vision, firmly held, but unjustifiable if all we have to go on are structures that hold commercial enterprises together. Ours must always be a quest of the heart, imagination, mind and conscience, adequately preceded by plenty of physical hard work.

In all of this work, the trees themselves have been our greatest advocates. A trayful of living plants burgeoning from their rock-dust-treated soil alongside their control counterparts speak more eloquently than all written reports and photos. Nevertheless, I've prepared an information sheet, *Rock Dust Soil Amendment Shows Promise,* as my best interim way of passing along results.

We aren't talking soil conservation any more. We're talking soil improvement, and that's something civilisation has never really attended to since the Sumerians bequeathed their worn out agricultural plains to the Babylonians – the land that's now gibber desert in the Middle East.

I hope that many will contribute to this work so that millions may benefit from what we learn. To me the world is a precious gift beyond belief. That we should take a purely exploitative attitude is now incomprehensible. Certainly there are two factors – time and money – which we must always take into account. But the great advantage of working with a dedicated Society of volunteers as *The Men of The Trees* is that we can put these factors in their rightful priority. They are on our list, but not at the top of it.

PREPARING A BROAD-ACRE REMINERALIZATION TRIAL

THE MEN OF THE TREES PLAN A DRY FARMLAND PROJECT

by Barrie Oldfield

Since the success of the nursery trials of rock dust, work has proceeded to plann for a ten-year trial on typical wheat-growing country near Dowerin, Western Australia. Information is shared with all who are concerned for the welfare of the land, particularly the impoverished, non-glacial soils of the semi-arid world, and their people.

Funding

The Men of The Trees is an international Society of volunteers. The Amery Acres project is underpinned by the great wish of members to work towards the Society's objectives: practical planting and protection of trees for the good of all life and halting the desertification process. The work to date has been supported by many private individuals and well-wishers whose donations are most gratefully received. This source of support is the most assuring.

Following the results of the nursery trials earlier this year, Pioneer Concrete have promised support of materials and services to the value of $30,000. This will cover not only supply and delivery of rock dust, but also the hire of heavy machinery to deep-rip the compacted soils prior to planting.

However, many aspects of the total operation have still to be covered and submissions have been made for funding in a number of areas, including fencing, vegetation establishment, access to water, supervision costs, accommodation and services headworks. As the project proceeds, other needs are sure to turn up.

Objectives of the Field Trials

- To rejuvenate the impoverished and fragile soil.
- To test primarily the theories of remineralisation.
- To explore a range of agroforestry systems that not only help to build soils, but also diversify farm production.
- To work toward a farming economy that's both demanding in skills and rewarding in results.

Amery Acres – The Broad Design

Amery Acres is part of a 200 hectare reserve originally set aside as a water catchment for a railway siding at the townsite of Amery, 5 km east of Dowerin. Today no steam trains pass, nor has the townsite ever been developed for housing. But the name "Amery" is on the map.

The project will be divided by tree-corridors into a number of enclosures of 1-3 hectares, a patchwork of small fields contrasting with the surrounding wheat and sheep paddocks, most of which cover several hundred hectares each.

The site covers approximately 23 hectares. It slopes down from a ridge at the western boundary, falling some 21 metres to the easternmost corner. Soils vary from deep 'gutless sand' to what are locally regarded as good sandy loams, quartz gravels, yellow and pallid sandy loams. This variation in topsoils makes the trial specially interesting. Mottled clays underly the top soil, the boundary varying in depth from 30-120 cm. Generally the soils are acidic in the range of pH 4.8-5.4. The exceptions are the loams under the remnant trees where the pH is around 7.

Broad planning takes into account the remnant trees, land contours and soil types. Native understory and replacement trees will be established along the two corridors of remnant trees. This will create wildlife habitat linked to the protected 100 hectare reserve to the North and East. New tree belts will be established along swales on contours which follow a broadly North/South line. This will divide the trial ground most conveniently into a number of fields. Where possible, placement of swales will also delineate soil type boundaries.

Magnetometer and conductivity surveys by Tesla 10 of Perth have revealed geological and hydrological features not otherwise visible. A dolorite dyke has shown up running downhill into the internal corner. As the orientation of this dyke is East/West, it isn't expected to give rise to problems of water cross-flow management. The conductivity survey, however, revealed a number of small areas at high salt risk. It's probable quartz reefs (not discernible by magnetometry) are responsible. These sites will be considered in tree planting and monitored over time.

A baseline data document has been prepared detailing climatology, location, topography, soil texture and pH, cropping history, total magnetics con-

Perhaps the most spectacular of all! Acacia saligna at 5 1/2 months were well on their way with well-developed phylodes of a rich shiny green.

tours, conductivity contours, remnant vegetation and type.

Farmers Show Interest

A site meeting in November drew interest from nine local farmers, particularly those concerned about conservation farming. Members of the Dept. of Agriculture, Dowerin Shire Council and *The Men of The Trees* made up a further nine. From the discussions that ensued, the following points were made:

◆ The need to plan for control plots throughout the trial.

◆ Trials should be economically feasible for a farmer to apply on his own land if techniques prove beneficial.

◆ Hope that deterrents other than fencing might be used to guard against rabbits. Fencing is regarded as too high a cost simply for vermin control.

◆ Several proposals were made for tree species to be tested, including *Sanatalum acuminatum* (Quadong), *Acacia saligna*, Atriplex species (Salt Bush), *Chamaechtisus palmensis* (Tagasaste), *Albizia lophantha*. Productivity should be the major criterion for tree selection.

◆ Project aims must be clearly spelt out.

◆ Fear was expressed that reticulation or hand watering for tree establishment would not be acceptable to most farmers.

◆ A general view that the system should have animals in it was expressed. The fencing and management should be planned with this in mind, even if in the first years animals would be excluded.

◆ Increased humus in the soil might best be achieved by seeding white lupin and mowing after flowering. The carting of compost or manures could not be sustained and should only be done for small plots within the overall trial.

◆ Mulch can be loaded into tree swales by raking stubble and other crop residues.

◆ The economics of applying rock dust at 20 tonnes per hectare was questioned. The trial should test lower and annual application rates for comparison.

◆ Questions were raised about the determination of the quality of rock dust (mineral content), also its cost, availability, trucking distance, methods of application, and how fine it needs to be.

◆ While the initial offer of Pioneer Concrete is generous and essential to launch the project, hope is expressed the Company will retain their interest and support throughout the life of the trial.

◆ Experience led to suggestions to create a fallow, in choice of species for cover-crops and green manures, in management regimes to mow and plough with the season to get the best effect.

◆ The importance of metre-deep ripping on the contour was stressed to allow good penetration of rain for the tree belts.

◆ Note was made of the need to check for herbicide resistance, particularly in relation to Annual Ryegrass Toxicity if sheep were to be grazed.

◆ Warning was sounded to always bear in mind our climate, the limited rainfall and its season. These factors largely fix the botanical limits to the trials.

◆ There must be one person resident on site to oversee all work, keep records and monitor the trial continuously.

Please Respond

This project will proceed because many want to see it work. You are one! Please respond to this as soon as you can. *The Men of The Trees* seek and welcome all input: material, practical, advisory, financial, and introductions to others keen to help.
Please write to:

Barrie Oldfield, State President
3 Over Avenue
Lesmurdie, W. Australia, 6076
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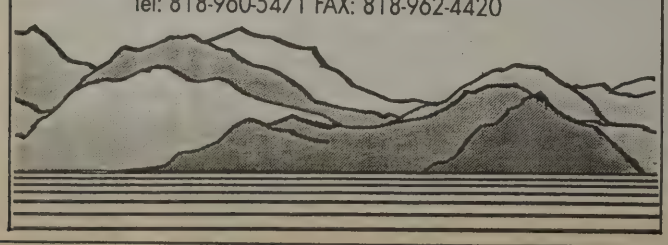

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SPECIALIZING IN SOIL REMINERALIZATION

Enthusiasm For SR On Recent South American Tour

by Betsan Coats

I am home again in Australia after what was really a good tour: a month in Brazil, a month in Argentina, and I was also in Montevideo and Santiago, Chile. On the way home I went to stay with Keith and June Gray in New Zealand, and also was a couple of days in Auckland. I started off with 10 days in Costa Rica. When I was in South America seven years ago there was a great interest in remineralisation, so a ground work had already been made. There was much more interest now. I found Costa Rica full of enthusiasm.

I gave fifty-seven talks plus television and radio talks, and also spoke in schools. Most of these were on the environment, with particular emphasis on remineralization. A translation of the *Snowballing Plea* script has been beautifully translated into Spanish by Maria Rosa de Garcia, (959 Paul Harris, San Rafael \5600, Prov. de Cordova, Argentina). All this translation is done voluntarily and it is not easy, because Maria Rosa de Garcia, like so many others, has to have two jobs to make ends meet. The *Snowballing Plea* is also translated in to Portuguese, Hungarian, Rumanian, Polish, and soon into Czecho-Slovakian.

The headquarters of the Theosophical Society in Brasilia, Brazil is very new and beautiful with a very keen group of young people, all dedicated to ecology. They have all my remineralising papers and are gradually translating them. They are all very much aware of the UNEP meeting in Rio in June, and are working to send papers to it.

In Hazelbrook, Franklin Scarf has founded the *Earth Repair Foundation* and they have 11 acres in lovely Blue Mountain country. (Franklin Scarf, 36 Montview Avenue, Hazelbrook, NSW 2779, Australia). *Earth Repair Action* is getting out a charter, which they want to be included in Rio. The group, which includes a number of Aboriginals, are chary of grinding rocks in case sacred rocks here get ground down. I have also suggested an addition to the charter about remineralisation. (See box.)

The group in Brasilia will then translate the charter into Portuguese and send the English version with Portuguese translation to Rio. It might have quite an effect. This is what we are hoping for.

The President of the Theosophical Society in Brazil and also of the Theosophical Latin American Federation is Ulisses de Resende. He is a go-ahead, dynamic man and keen on working for the environment. The T.S. is well established in South American countries, and apart from its philosophical aspects and teachings, works for causes important for humanity as a whole. I had very good and enthusiastic audiences.

CHARTER FOR THE EARTH SUMMIT IN RIO
A Proposal On Soil Remineralisation

Recognise the vital importance of Agrogeology, the remineralisation of the Earth's soils with suitable mixes of natural ground rock, which is the source of the perennial natural fertility of areas such as the Ganges Basin, the Mekong Delta, the Rhone Valley, the foothills of the Andes and other areas watered yearly with glacier water clouded with particles of rock. The use of agrogeology is an economic way to stimulate the micro-organisms in the soil, to increase root growth considerably and resistance to extremes of climate, hence longer growing seasons. It regenerates the soil, until further remineralisation becomes seldom necessary. It greatly increases the nutritive values in all food and fruit crops and renders the use of pesticides unnecessary, as plants are healthier. Used with humus and organic mulches it supplies vital trace elements. Tests show that young trees, fed rock dust, grow stronger and three times as fast, an asset for re-afforestation.

To feed the human family with increased yields of health-giving food, soil remineralisation is essential.

Rock Dust for Africa

by Eckhart Stoyke

A recent article by the Carl Duisberg Society in Berlin, by Christina Kamlage in cooperation with two members of the Technical University Berlin, Christoph Schreier and Günter Matheis, *Rock Fertilizer – A Chance for West African Food Production.* is a contribution in the new field of agrogeology.

The population south of the Sahara numbers about 520 million, and one out of four is under nourished. This population grows at a rate of 60,000 a day. Food production declines by 1% annually.

The problem is not one of lack of agricultural area, but rather of *fertile* soils. Senegal, Zimbabwe, Tansania and Mauritius have access to NPK. Overuse with negative results for plants and groundwater are the consequence here.

Tropical soils are far more depleted of nutrients than soils in the moderate zones. Nearly all sub-saharan states have access to igneous rock material rich in trace nutrients that can be economically converted to fertilizers, says the report. This would also create local employment.

Laboratory and field tests with dust-grade rock flour "positively affected plant growth". Moist and warm areas with an annual precipitation of 500-600 mm are the most suitable for fertilization with rock dust. The highest yields were obtained with a combination of rock dust and chemical fertilizers.

The followers of this new method find little support from the population at large, and especially the traditional agricultural experts.

What else is new?

Up to now, only limestone and rock phosphate were accepted as fertilizers. They therefore intend to teach people locally what rock types are suitable and where to find them. The idea of locally available rock dust is mainly to help the small farmers who comprise 75% of the population.

REAP Society
(Restorative Ecological Agriculture Project)

Regenerating Appalachian Forests

An Interview with Forestry Expert Robert Bruck, Ph.D.

Director of the Environment for North Carolina

by Joanna Campe

Larry Hoffman

Remineralizing and planting trees on Mt. Mitchell are 12-yr. olds Lindsay Gaster, left, and Leah Wilk of the group EarthDance.

Whither the Trees?

In the 1970s on the remote peaks of distant mountains in the southern Applachians, many trees began to wither and die. Through the 80s, this death of trees spread rapidly to become a sylvan holocaust as mountaintops became bald with skeletons of dead and dying trees. By 1988 the "ring of death" on 6684 foot Mt. Mitchell (highest eastern peak) had descended to 5100 feet, was still dropping, and no authority could state what was killing so many millions of trees.

Dr. Robert Bruck, professor of plant pathology at No. Carolina State University, with many other scientists and citizens searched for a cause and cure of this sudden ominous collapse of an entire boreal ecosystem. Mt. Mitchell became a barometer of our global future.

In 1990, EarthDance, a non-profit environmental group in Asheville, NC, asked Dr. Bruck about their plan to plant seedlings on Mt. Mitchell, each fertilized with a megadose of micronutrients in the form of Planters II rock dust. In April, 1991 5,000 seedlings were dug in by adolescents, college students and a few adult volunteers. This is now the largest controlled study of forest remineralization currently underway in North America.

*Dr. Bruck was recently appointed Director of the Environment for the State of North Carolina. Just back from a trip to study European efforts to regenerate their own dead and dying forests, Dr. Bruck spoke to **RE** Editor Joanna Campe.*

Joanna Campe: Give our readers a summary of the state of forests in the U.S., particularly forests and species most endangered, and what's causing the decline.

Robert Bruck: In North America we've seen over the past ten or fifteen years significant and serious decline of certain forest species. The ones we're most concerned about are high elevation red spruce and Fraser fir forests in the Appalachians. These forests comprise very unique mountaintop ecosystems on four, five and six thousand foot peaks. They're quite rare in that they're remnants from the last glaciation period: very beautiful, very unique. We've seen very rapid decline, dieback and death of these forests occur to a great extent in high elevations of the eastern Appalachians.

Second, we've seen a very rapid decline of sugar maples in the northeastern United States, both in sugar bushes and in natural stands. This caused great consternation, not only for the ecological and esthetic beauty of these trees, but just as much due to the economic value of sugaring to northeast states and eastern Canada.

Third, we see, particularly here in the southeast, growth loss and decline of commercial pines, such as Lobblolly pine. Multi-billion dollar industries depend on these trees' healthy growth, mostly for fiber for paper production. We see as much as a 30%t decline in growth rates since 1960.

Now, when we get into the cause of these problems, there is a tremendous amount of equivocation and debate. One string that goes through the entire system seems to correlate very, very closely to problems we are seeing right now: air pollution. Now, air pollution can be divided into several categories. One is acidifying compounds we generally call *acid rain*: nitric and sulfuric acids caused by the fossil fuel combustion.

Second, we're very concerned about man-made ozone. This isn't the "good" ozone that's 20 miles up, but rather "bad" ozone created principally from auto exhausts. Nitrogen oxides and organic hydrocarbons combined with sunlight cause photo-chemical oxidation to produce ozone, which is very detrimental to trees, as well as people.

As this chronic stress increases throughout industrialized regions, the major concern is health of the soil. If air pollution itself, acting only on tree leaves or needles, were the problem, the answer would simply be to turn off air pollution and everything will be better.

Unfortunately, all air pollution – including heavy metals, coal burning and smelting metals – end up in the soil. This tends to acidify soil, put toxic chemicals in soil, and ultimately, literally, from an ecological standpoint – sterilize and retard the productivity of soil systems. Unfortunately, these systems take a great deal more time to recover than a simple leaf exposed to sulphur dioxide. Once you turn sulphur dioxide off, the leaf or tree will get better.

What we're most concerned about right now isn't necessarily acute or short term ramifications of air pollution, but rather chronic, long term implications of air pollution. This is where soil remineralization comes in.

JC: You were in Europe recently. How does the situation there compare with the state of U.S. forests?

RB: I was just showing the Governor of North Carolina pictures of that this morning. The reality is that the forests there are far, far worse than here. Literally hundreds of square miles of dead forests in southern Poland, southern Germany and northern Czechoslovakia. Damage done from

Our analyses found nitrogen, phosphorus and potassium weren't lacking in these soils. In fact, in many cases they were abundant.

On the other hand, when we looked at many trace elements, particularly those susceptible to being bound or leached by acids, we found quite a depletion.

the absolutely unmitigated burning of dirty coal – sometimes as much as 18 percent sulphur – it's unbelievable to see what happened there. Damage we see here, with the exception of high elevation forests, is pretty benign, compared with Eastern Europe.

On the other hand, we're looking at the corollary here. Our high elevation eastern forests make a very nice corollary because they look almost identical – millions of dead trees. Eastern Europe is far, far further down that road to destruction than we are. Hopefully, we'll never, ever approach what they've done. I think there's a very important lesson to be learned there.

JC: When did you become concerned about minerals and trace elements in regards to forest health, and where did it lead your research?

RB: Well, soil has always been at the forefront of this subject. My colleagues who are soil chemists and physicists have looked looked at these soils in our permanent plots, particularly in high elevation forests, and found almost without exception, they are very poorly buffered soils. This means they can't absorb acids very well, and are very susceptible to leaching of trace elements, particularly magnesium and calcium, which react with acids in the soil. And because of high organic matter contents, they're very susceptible to holding heavy metals, such as aluminum, lead, zinc, copper, cadmium, in soil matrices.

Therefore, the idea of soils being the problem was always at the forefront. As we became more interested not only in what the problem is, but what to do about it, forest fertilization or *trace mineral* fertilization, came to the forefront.

Our analyses found nitrogen, phosphorus and potassium weren't lacking in these soils. In fact, in many cases they were abundant. On the other hand, when we looked at many trace elements, particularly those susceptible to being bound or leached by acids, we found – as in Europe – quite a depletion. We learned our cue from Europeans – particularly West Germans – regarding application of trace minerals. In their case, they're applying dolomite/limestone on their forests. Frankly, from experimental fields I've seen in the Black Forest and other areas, they've had remarkable recoveries from air pollution effects by application of mineral slurries and/or dusts.

Years ago I became interested in doing this myself. Always had problems finding support for such studies. Nevertheless I became more and more in touch with and interested in remineralization and trace mineral fertilizers. That led to the preliminary experiments we have now at Mt. Mitchell and Grandfather Mtn. in North Carolina. Mt. Mitchell, highest peak in Eastern America, is severely damaged at this time.

JC: When did you come across the work of John Hamaker, and how does it coincide with your own work?

RB: I was initially approached by Larry Ephron out in Berkeley, who I understand passed away about eight months ago. He contacted me – I didn't contact him – regarding Hamaker and others. I read the book and saw the video *Stopping the Coming Ice Age,* and discussed this with many people. Of course, there's a lot of truth to it.

This is the thing we always deal with: "Can you prove it?" It's very difficult to do. We can't go back 20,000 years in time to see what Earth was like back then. On the other hand, there's little doubt from purely a logical, chemical view that long-term depletion of soil systems ultimately leads to many problems in productivity, sustainability of forests and agriculture, and many others. This is where I initially became aware of the work that was going on.

I've done natural rock or granite dust trials in the greenhouse and had some minor effects on pine and spruce trees. I never really pursued it far, but ultimately I found out about Planters II, from U.S. Soils in Colorado. In my opinion, it seems a fairly well-balanced mix – far more concentrated, of course, than a rock dust type slurry.

What I've learned is one of the biggest problems we face in forestry is the delivery system. In agriculture, you simply put whatever the material is in a fertilizer hopper, zip down your field and you've taken care of your problem.

When you deal with remote forests, very often it takes a tremendous amount of labor and/or aircraft to get materials in. When I saw rock dust and dolomite-limestone experiments going on in Europe, I realized that, by U.S. standards, actual labor and application were probably ten to 100 times more expensive than the substance itself.

JC: Yes, that's a major challenge to remineralization for forests. What about military transport planes? In the area where I live in western Massachusetts near Quabbin Dam, military transport planes from a local base often fly over doing exercises. Do you think we could apply it that way – perhaps in cooperation with government, or the military?

The fact is that if air pollution itself, acting only on the leaves or needles of trees, were the problem, the answer would simply be to turn off the air pollution and hence everything will be better again. Unfortunately, all of these various air pollution products – including heavy metals and the burning of coal and smelting of metals – ends up in the soil. This will tend to acidify the soil, put toxic chemicals into the soil and ultimately, literally – and from an ecological standpoint – sterilize and retard the productivity of soil systems.

RB: The possibility is there. The military is the obvious benefactor of thousands of aircraft that could do these things. Personally, I'll be honest: I'm skeptical of working on these programs with the federal government because, for reasons I've never understood, many federal offices, including Forest Service, are reactive, rather than proactive about these situations. Not until they're utterly convinced through science and/or politics it's worth their while to get involved do they actually volunteer their services.

JC: A sense of urgency needs to be recognized before the government would cooperate....

RB: There would have to be an urgency, and I think the only way we get to the point of expressing urgency is through science. That's my opinion – by actually having the data. Even if it's preliminary data, even if it's not extensive data, I think you've got to present the before and after – the treated and non-treated – to show a response is taking place and hard numbers to go with it. That's not something that's simply self-serving. I'm not trying to say that as a scientist, but as a pragmatic citizen, understanding you're not going to garner a lot of support until you have those numbers.

JC: Tell us about EarthDance Institute and how you came to participate in their remineralization project.

RB: The philosophy behind EarthDance is really something I agree with. They particularly want to involve children and teenagers with a proactive spirit when it comes to the environment. Mark Fields, their director, believes peo-

ple – children, adults – become depressed and tired with the constant negative news out about the environment.

I think there's a lot of truth behind that. You get overwhelmed; you almost end up where denial sets in and you don't care anymore. Yes, we must inform people what's going on, but we must also get them involved proactively fixing problems, instead of simply going out with a placard, picketing a lawn, jumping up and down yelling. Let's go actually do something to make the situation better.

So, the philosophy I agree with. I think it's great. Obviously, it can educate people while making them psychologically feel they're part of the cure.

As often happens, EarthDance came to me. I hadn't heard about them. In fact, they're a new group that organized itself out in Ashville, North Carolina, in our mountains. Apparently, they found out about my work in those mountains and contacted me about reforesting trees up in these devastated forests, and to remineralize the soils to see what response we could get. I became interested in this, and volunteered my advice and services.

Quite a number of months ago, in spring, we planted about 5-6000 trees on Grandfather Mountain and Mt. Mitchell, and remineralized half with Planters II and left the other half untreated. The purpose is to follow the growth, mortality and other physiological parameters of these trees, to see what goes on. From the scientific standpoint, although it's a small and preliminary experiment, it's nevertheless a good start, to see what happens.

JC: Sounds like a wonderful approach. What process did you use to select a source of dust? Why did you choose Planters II?

RB: I was given samples of many, many types of rock dust to use, and found all seemed like good stuff. However, rates recommended to get enough material into a forest ran from two to three tons per acre. With many of these mountains, you're dealing with thousands of acres of trees that need to be treated. Whereas with Planters II we used 175 pounds per acre for our experiment, due to the unique sedimentary nature of that rock, if I can call it that. It's really sediment, rather than rock. I don't know if you're familiar with Planters II, but as a pellet, it's a very desirable way to distribute material, even by hand.

JC: It's very safe to apply?

RB: Completely non-toxic. In fact, a homeopathic physician in Ashville feeds it to cancer patients. Apparently it has a purifying nature. I actually put a few pellets in my mouth and it doesn't taste bad. It's very safe, has no heavy metals, no caustic substances, and comes as a small pellet. By virtue of that fact, you can drop a handful on an area or spread it across an area – it doesn't blow away, doesn't stick all over you. Hence, the lower weight that can be used combined with how it's formulated made it very desirable.

I'll be honest – with EarthDance, if I had to apply regular rock dust two to three tons per acre, I don't have the slightest idea how we would have done that. We thought about fertilizer spreaders and realized the roots, rocks, steps and everything – it simply would have been impossible, short of working in aircraft, and frankly, very few people could afford two thousand dollars an hour for that.

JC: You mentioned homeopathy. Dr. Gernot Graefe, an Austrian scientist associated with their Academy of Science who works with the government, has done tests for agriculture, including remineralization. With Dr. Maria Felsenreich, he's been testing treating forests with homeopathic spray solutions of rock dust Also, an Austrian prince, about three years ago, was remineralizing his forests. I know he used rock dust on one part and homeopathic spray in the other. I want to get back to him; I'm very interested in the whole problem of transport, what results he might get, even though it seems a bit far out of normal science.

EarthDance Update

The Exciting Results From Remineralization Trials On Grandfather Mountain in North Carolina.

Below is a brief summary of our preliminary experimental data regarding the effects of Planters II on the growth and survival of red spruce and Fraser fir. As a brief introduction, I would state that red spruce and Fraser fir are the boreal montane ecosystem species here in the high-Appalachians of the northeastern and southeastern U.S. These trees have undergone tremendous stress via air pollution over the past several decades and, indeed, certain air-borne and satellite surveys have indicated that as much as 40 percent of this ecosystem has already died.

There has been severe depletion of micronutrients as well as calcium and magnesium from the soil due to incessant insult from acid rain and cloud deposition. Many of the trees become yellow, followed by the abscission of needles and death.

Two series of experiments have been conducted: first, under greenhouse conditions, and second, in the field. The data are summarized below:

Greenhouse Experiments. During 1989 -1990, 500 five-year old red spruce and Fraser fir trees grown under greenhouse conditions in Raleigh, NC, were planted into 8-inch peat pots containing natural soil from Mt. Mitchell, NC, excavated from an area approximately 5,800 feet above sea level. The plants were maintained under greenhouse conditions for one month accompanied only by watering three times a week in order to acclimate the trees.

Following this one-month acclimation period, Planters II was applied at the following rates: 50-gram/pot, 25 g/pot, 10 g/pot, and 0 g/pot. After a 6-month period, observations were made on root color, diameters, height-growth, and survival.

- In the 50-gram treatment, all red spruce and Fraser fir survived.
- At 25 g/pot, all red spruce and Fraser fir survived.
- At 10 g/pot, all red spruce and Fraser fir survived.
- At 0 grams Planters II/pot, 87 percent of fir survived and 77 percent of spruce survived.

Obviously, the Planters II had an effect on the survival of the trees. In addition, the growth of both Fraser fir and red spruce was enhanced.

For red spruce, 37, 18 and 5 percent, and for Fraser fir 39, 21 and 14 percent at 50, 25 and 10 grams Planters II rates, respectively, as compared to the 0 gram control treatments.

RB: It would be interesting to find out, for sure.

JC: If you had resources for a large scale project, how would you design it?

RB: Easy. There are standard statistical designs to test any fertilizer-type regime – things we've done in forestry a long time. If you decide to put in a 50-acre trial, there are ways to find a disturbed forest, sample that area for initial soil and tissue characteristics, go in at different rates remineralizing those forests, go back over periods of time collecting soil, tissue and root specimens, taking all sorts of data and, ultimately, come up with a statistically validated comparison of treated versus non-treated areas.

Twelve weeks after application of Planters II, height growth of red spruce was increased by 27% over non-treated controls, and height growth of Fraser fir was 19% greater ... The general apperance of treated trees was that of a very dark green color and good flushing of 1991 tissues, whereas untreated controls appeared to be somewhat yellow and chlorotic.

Field Experiments. On April 18 through 22, 1991, a group of 21volunteers, graduate students and I planted some 6,000 red spruce and Fraser fir seedlings on Mt. Mitchell, NC, (see ***RE*** # 2) at an elevation of 5,500 feet (the natural forest in this area is severely declining). The plots were split in half and 175 lbs./acre of Planters II broadcast on each split-plot of Fraser fir and red spruce, respectively; the other split-plot received no treatment.

Approximately a week and a half ago, several graduate students and I measured 1,000 trees from each treatment, at random, for height and made notes on the general appearance of trees. Twelve weeks after application of Planters II, height growth of red spruce was increased by 27 percent over non-treated controls, and height growth of Fraser fir was 19 percent greater than that of untreated controls. The general appearance of treated trees was that of a very dark green color and good flushing of 1991 tissues, whereas untreated controls appeared to be somewhat yellow and chlorotic (not unexpected),

Sometime this October, we will return to Mt. Mitchell in order to do soil analysis, tissue analysis, including chlorophyll content, and a compete survey of height growth, root collar diameters, and survival of trees. In addition, perhaps one of the most important observations will be the overwintering survival of said trees during the winter of 1991-1992. We will, of course, return in early spring of 1992 to gather these results.

I am quite pleased with the preliminary results of Planters II in being able to ameliorate the effects of acid deposition on spruce/fir forests.

The well balanced trace mineral formulations of Planters II is obviously either changing characteristics in the physiology and biochemistry of the tree itself, changing edaphic factors in the soil, or perhaps (most likely) both. Although our work is preliminary in nature, I feel at this time that much larger trials are needed to be established for the purpose of truly evaluating the long-term effect of Planters II on being able to rejuvenate ecosystems that are obviously very much adversely effected here in eastern North America and in central and eastern Europe. I look forward to these experiments in the future.

Robert Bruck

Then, in treated areas, test the rate used to see what kind of response you actually got. Ultimately, you end up with a package of information that says, "Yes, it works," "No, it doesn't," "Yes, it works at this level but not at that." And that's exactly the package of data the Forest Service or Department of Defense or whoever, will look for before they would even talk about getting involved.

JC: I'd like to see different rock dusts used for comparison.

RB: Oh, absolutely! No question about that. It would be foolish not to compare different substances to see their relative response.

JC: With experiments I've seen in Europe with rock dust in forests, they used, for example, a diabase or basalt dust that would be interesting for forest trials here. Greg Watson, currently Massachusetts Commissioner for Food and Agriculture, and I spoke together to maple growers about a year and a half ago, suggesting a local source of basalt which is very, very fine. In fact, it would have to be applied carefully in small amounts, because it goes through a 400 mesh screen. We suggested that maple growers here try it, and in one town, New Salem, MA, I believe several growers have. I want to get back to them and see their results.

When do you hope to see the result for the Mt. Mitchell trial?

RB: Well, actual final results for this year will be done probably by mid-October – when trees start going dormant – stop growing for the year. At that point, I'll measure all the trees, and obviously, look at characteristics of whether alive or dead. In addition, bring soil and tissue samples to the laboratory to analyze, and go through the whole statistical procedure doing an *analysis of variants* to see what differences there are.

The philosophy behind EarthDance, which is really something I agree with, is that they particularly want to get involved with children and teenagers, with the idea of a proactive spirit, when it comes to the environment. According to Mark Fields, who's their director, he believes that people –children, adults, whoever – become very depressed and very tired in dealing with all the negative news that's constantly coming out about the environment, and I think that there's a lot of truth behind that.

After one year of growth, we'll have a good indication what's going on. But just as important, this coming spring of '92 we'll go back to these harsh ecosystems to look at survival of remineralized versus unremineralized trees.

One of the biggest problems in replanting these areas is the trees simply die – a great deal of stress – from wind and ice, as you can imagine. If there's a significant difference there alone, that by itself would probably be a good omen in terms of the value of the remineralization process.

JC: Twice I've visited Brixlegg Forest in Austria, where George Abermann applied the diabase product called *San-Vita*. It was amazing to see the results. They have a copper smelt nearby, and there's copper, cadmium and lead in the soil. Nothing wild grows – bare duff and deformed trees. Spruces, for example, grow like bushes, bushing downward. Some older trees had side shoots growing out in a deformed way, and so on. Abermann saw results after about six months. It was amazing a few years later to see wild strawberries growing in the remineralized area along with other wild plants.

RB: That's incredible!

JC: There were tree stumps with plants growing out of them, which wasn't true of the rest of the forest. I have slides of this. Spruce trees six or seven years old were doing very well. They'd been remineralized about four years before I saw them.

RB: Areas I just visited in northern Czechoslovakia, southern Poland and Germany sound almost identical. We're talking about hundreds of square miles just devastated by heavy metals and air pollution. If there's any hope to get those forests back, in my opinion, it's through

They go and replant trees that die three to six months later, and they pull it out and shove another tree in the ground. To me, no offense to them, but they're just wasting their time and money. They need to change the entire soils system.

remineralization. They replant trees that die three to six months later, so they pull it out and shove another tree in the ground. No offense to them, but they're wasting time and money. They need to change the entire soil system.

JC: Scientists in the Brixlegg region insisted it would be necessary to bring in totally new soil. When Abermann decided to try rock dust, they didn't expect any results.

You've seen improvements in forests with dolomite limestone. This is a little different than the idea we have. It certainly affects pH. I'm curious about a comparison of results between using limestone and hard silicate rock dust.

RB: A very important point I've raised with my German colleagues. They admit themselves that using dolomite limestone... they use the analogy: it's like taking aspirin for brain tumors. They understand acid rain leaches a tremendous amount of magnesium and calcium from the soil. What they're doing is simply replacing that magnesium and calcium, but they find when they stop re-applying dolomite, the forest goes back to the way it was. Therefore, in my opinion, and I've discussed this with them, they aren't significantly changing the long term prognosis; not turning around the soil's quality.

JC: Yes. George Abermann, for example, told me that just putting lime or limestone into the forests will destroy the humus-building complex.

RB: That's partially true. In the short term, it'll make the trees look good.

JC: By affecting the pH?

RB: That's right.

JC: But it doesn't have enough trace minerals and elements in it for the long term.

RB: That's right.

JC: That's interesting. Did you know that in Germany, you're not allowed to put anything in the forest but limestone? It's a law.

RB: Really? I didn't know that.

JC: Yes. There are substantial companies with agricultural rock dust products in Germany, and they can't apply their product to forests because of the lime industry. Only limestone can be applied in a forest, nothing else. It's the only amendment that can be applied. So, all the work I've seen with forests and applications of other soil amendments, has been in Austria, not Germany.

RB: God bless America. I know what you're saying.

JC: We have to do something about that. If remineralization proves effective for bringing back the forest, what strategy do you recommend to bring this about?

RB: The way I look at it, is basically two or three stages. First, in my opinion, based on 15 years knowledge of bureaucracies, it will be difficult-to-impossible to get federal involvement with what we're doing right now, because there are budgetary problems and all sorts of things going on. What they'll say is, "You have no definitive, hard core, empirical proof."

On the other hand, what's called the private sector – foundations, environmental activist groups, whatever it takes – is able to pull funds together, get people in different parts of the country, scientists, interested and working on this, and get some good, scientifically-based trials out to collect data. For better or for worse, this is at least a two or three year project. This isn't something you can simply just go in and then come out six months later and say, "Bingo, look what we got." Certainly, we could collect data and publish it, but we'll be hesitant to draw firm conclusions until we really see what happens over 2-3 years.

JC: Two or three years is a short time, actually, as far as forest research goes.

RB: To me it's a very short time, but to some people that sounds forever.

JC: Due to the urgency of the problem.

RB: Right. But if that information looked promising, you could start making connections with federal agencies. You have to almost put it in the sense of, "You look good if you get a program started, because you'll be fixing what's gone wrong with our forests." That's more or less the tack I'd take personally, involving grassroots organizations into volunteering money, the labor, time to make these things happen under scientific supervision. Following analysis and publication of the results, hit it on a much bigger scale.

JC: Please tell us a bit more about the idea you mentioned with Greenpeace of setting up a forest fund?

RB: It seems many environmental organizations, whether Sierra Club, Greenpeace, Friends of the Earth, Environmental Defense Fund, are all out there trying to actively do something about the environment. If there was a way to raise money, through whatever means... I've often had the idea, "It would be great to throw a rock concert or something on Mt. Mitchell!" to raise money to get the place alive again! I know it sounds far out, but I think it's very do-able, and with 25 or 50 thousand dollars in the bank to get materials, be able to get experiments in....

JC: How much money did you say?

RB: Well, I would say it would take $25-50,000 to really do it right. This is a kind of ballpark number I would shoot for. Sure, we could take a lot more than that. That also depends on how much volunteer labor there is – whether people will donate materials for experiments – but the bottom line is this would be a way to make something happen, instead of waiting around and playing politics forever. We could actually get something started, or as the old Chinese proverb says, "A journey of a thousand miles begins with a single step" and we can't wait forever.

Well, I got back from my meeting with the Governor and I'm looking at my phone messages right now. Do you know A.E.? He's calling about the Indian Embassy being interested in rock dust. I'll have to get back to him. So, you know the word's out in terms of the potential to do things. It will take some leadership and guidance of where it will go in the future.

JC: Coordination and networking is important. For example, in India a French scientist with ICRISAT named Dr. Michel Pimbert, is doing SR trials with chickpeas. His work has been published in the last year.

RB: One thing I think needs to be done – I remember speaking to Larry Ephron about this on a dozen occasions – I honestly believe funding needs to be found for an international conference on this. Bring in experts invited from different walks of life and areas to get together a published proceedings that's widely distributed to get this information out. Part of the biggest need we have right now is for people to talk to each other or send reprints to each other. Very often they're in foreign languages we don't understand. It seems the amount of information that's out there, although it's fairly substantial, is completely disorganized right now, and needs to be brought together.

JC: I'm happy to hear you say that. Perhaps there's a way to now do something like that.

RB: I think these are important, not only to get the information out, but also the kinds of contacts made really allow multidisciplinary cooperative research.

JC: Well, I feel this conversation is very important. You've given us some ideas to pursue at this point that could be coordinated by a group of people here, and I'm really excited about that. Thank you very much.

RB: Good. I look forward to hearing from you soon.

EarthDance Institute Update

With Your Support

- 50 more acres of forest to be remineralized
- Create an Earthdance Center in your region
- Rainforest trip for children in July

by Mark Fields

In the last issue of ***Remineralize the Earth*** readers were informed about the remineralization and reforestation projects at Mt. Mitchell and Grandfather Mountain in North Carolina. Today miles on end of dead and dying trees stand as vivid and frightening testimony of what we may face if we don't wake up and respond effectively to the problem now.

The research projects began in the spring of last year and involved about 50 teenagers, some teachers and parents, and was directed by Dr. Robert Bruck of N.C. State University. The intention of the research is to acquire scientific data that will show positive responses from the older dying trees and seedlings to the mineral dust and to involve young people in a process that will impact their lives by positively affecting a problem that appeared by most to have no hope, therefore turning hopelessness into hope. Teaching them that we can make a difference in our world if we just go for it!

The Project Expands To 50 More Acres With Your Help

As an expansion of our initial research we have recently submitted to the State Forestry Authority a permit application to begin a larger scale remineralization research project on Mt. Mitchell. This project will include 50 acres of seriously damaged forest, 25 acres will receive a mineral dust application (Planters II), of approximately 500 lb. per acre. This 5 year project will also be directed by Dr. Bruck and will be supported by a group of 12-20 environmentally committed teenagers from EarthDance. Other remineralization research is also being coordinated by EarthDance and youth volunteers with the Dogwood and Oak trees that too are showing signs of decline and weakening in western North Carolina.

This research promises us all great environmental rewards, but will only continue if we all help to make it happen. The projects are totally funded by individual contributions, by people like you that care, we can not do it without your help. Thanks to U.S. Soil for their generous contributions of Planters II, and their promise of continued support.

Create an EarthDance Center in Your Area!

If you are concerned about the future of the Earth and our Children, and would be interested in creating an EarthDance Center in your community, we need you! Our vision is to create EarthDance Centers across the globe, where the children of the world can begin to work together in creating the future of the Earth. If this is your dream too, please contact us. New chapters may be opening soon in Nashville, TN, Delaware Water Gap, PA and in Ontario, Canada.

Kids Reach Out to the Rainforests of Costa Rica

On July, 30, 1992, 25 students from around the U.S. will travel to Costa Rica to learn about the rainforests, why they are important to us all, and what they can do as individuals to help stop their destruction. The 14 day visit, sponsored by the EarthDance Institute will include instruction and interviews with rainforest scientists, environmentalists, political leaders, families and businesses that depend on the rainforest. They will visit the U.N. University for Peace, the International Children's Rainforest and much more. "The idea is to allow them to get a clear picture for themselves, and not simply read it in a textbook" states Mark Fields, the director of EarthDance. "This way they *experience* why they are important, and can begin to genuinely care and want to do something positive. I firmly believe that this trip will be transformational for the youth participants. Our goal is that kids return home as teachers to their communities on the rainforests, and what we all can do to help preserve the remaining ones."

The trip still has some vacancies left, if you have a child 13-20 years, concerned about the Earth's future, and would like to go. If you would like to help sponsor a child's trip that can't afford to go, make a tax-deductible contribution to the EarthDance Institute, Rainforest Scholarship Fund. It will change a child's life.

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Forest Insect Control

by Mary Vogel

What do several organic farmers in Oregon have that can help our ailing forests? Do their years of experience with a simple product like rock dust relate to insect control in our forests?

For years organic farmers like John Sundquist in Coburg have applied rock dust to their soil. "What's most remarkable about plants grown in remineralized soil is their insect resistance," says Sundquist.

Last summer, when all neighboring farmers (all non-organic) had a severe problem with corn earwigs and spider mites, John's plants were healthy and free of insects. Sundquist had similar results with root maggots, flea beetles and other insects over the five years he's used rock dust.

Corvallis seed grower Dr. Alan Kapular and organic gardener Samantha Kaswell of Eugene had outstanding results with insect resistance on their crops too.

We suggest that the same helicopters that U.S. Forest Service proposes to spray insecticide be put to better use spraying rock dust instead. Such application would begin to remineralize the soil.

This was discovered in the dying Black Forest of Germany when the only healthy area in a dead forest with no understory was an area below a gravel quarry. Where rock dust blew from gravel trucks onto the forest, the understory was vigorous and trees thrived.

Results of long-term experiments in Germany released in 1986, show that a forest where pine seedlings were remineralized, after 24 years, *had four times more wood volume* than the untreated area.

Could remineralization be part of a long term solution to our timber supply problem? Is it worth a try? We at Forest Conservation Council think it is!

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An Interview with Dr. Herb Owen of U.S. Soil

by Joanna Campe

Joanna Campe: Tell me the history of U.S. Soil: when and how it began, who started it, how they discovered this particular rock dust, and that it was good for agriculture.

Dr. Owen: As I understand it, the discoverer of the U.S. Soil deposit was a gentleman named Joe Lionel — an old entrepreneur here in the town of Salida. He did everything from selling cars, trading horses, and so on. He found this peculiar deposit, dug up some and, just out of curiosity, put it on his garden. He also threw some rocks in with a bunch of pigs. He noticed the pigs began to eat those rocks, and he felt the garden tasted much better when he used this rock mineral on it he just couldn't believe it. One thing led to another and he began to dig and blast it out to use himself – gave some to his neighbors – and began to transport it in a pickup and sell it to people around Colorado.

JC: When was that?

Dr. O: Approximately 50 years ago. U.S. Soils has been in business approximately 41 years, but Joe was doing this before U.S. Soil was actually started. This gentleman had no formal education, but was very bright and could certainly observe what was happening. He had no real idea why this was happening, but he did realize that good things happened when they used Planters.

I don't know where they got the name Planters. This gentleman had a nephew named Joe E. Lionel who he raised as a son, and he is now the sole owner of U.S. Soil. He taught Joe E. all about it and Joe E. was a bright young man. He also decided to do some things and get the company going. So they bought a fertilizer plant in Kansas City that was no longer in use and moved it to Salida, lock, stock and barrel and set it up.

JC: From then on it became a fairly large company.

Dr. O: It's been solely owned from the beginning. It's never gone public. It was all agriculture; it's been up and down somewhat, but it has been a multi-million dollar company in the past.

JC: Tell me the geological history of the rock itself.

Dr. O: There's a tremendous controversy among geologists as to exactly what this material is. We don't really know for sure. It's apparently a fresh water deposit of some type, because it is not at all salty. It has very little or no sodium in it.

JC: Are you saying millions of years ago there was a lake where the deposit stands now?

Dr. O: It's doubtful it was a lake, because it's not large enough. It doesn't spread out flat. It's more of a massive tubular deposit – it may very well have been some type of a fresh water, hot spring deposit in a prehistoric sea. There's little or no organic matter in it, that we know for sure. I'm just not positive what it was, but it did leave this – oh, I don't know, some people feel it was something like fifty million years ago, but we're not sure.

JC: What would be a geological description of the rock that's used to make Planters II?

Dr. O: The closest thing we have, and it's not truly accurate – often it's called gypsiferous shale. It does contain some iron pyrites, some gypsum and a large number of things. If we have to register it in a state as a trace mineral fertilizer – we refer to it as a gypsiferous shale and that's probably as close as anything I can think of.

JC: I assume over the years you've had extensive trace mineral analyses done of it. Do you know how many trace minerals you've tested for and found in the rock?

Dr. O: Well, it's difficult to tell, because it depends on how much money you spend on your analysis. You can get down to one part per billion, and that's getting pretty hard to detect, but I've got a list here. It's approximately 35 elements we know for sure are there, that we actually had analyzed. That goes down to about one part per ten million of some, but most are quite a bit larger. I frankly have a great deal of reticence believing someone who says they have 60 or 70 elements in a deposit, because it just doesn't occur that way. This has got everything from nitrogen to zinc in it.

JC: When did they start to pelletize the product?

Dr. O: About the same time they bought the fertilizer mill – about 40 years ago. They used to sell it as a dust, but then they began to pelletize it in a big cylinder. You pulverize the rock to dust and put this dust in the cylinder and it turns, then you put some type of liquid in to make little pellets of it. Years ago we used a wood base, dissolved lignum. Now we use just plain old beet sugar.

JC: What are the advantages selling it pelletized?

Dr. O: Dust is very difficult to use. First, it's very fine, it will blow, it's hard to get evenly distributed across the soil area you want to treat, whereas if it's pelletized, you can run it through a little circular distributor – like they use for seeds. Or if you're going to do it on a farm, you can use a regular fertilizer spreader. It gives much more uniform spreading. It's easier to handle.

JC: It's interesting that it takes so little of this product to get results compared with what we normally advocate. We normally advocate of rock dust, which is often not ground so fine, tons to an acre, and with Planters II you recommend applying normally only 150 lb. to an acre.

Dr. O: We normally recommend about 250 lb. per acre for 3-5 years, depending on how badly depleted the soil is and how badly it needs trace minerals. Then we recommend after that about 100 lb. per acre, or even less would work, as a maintenance material after you've built it back up again. They've used only 150 lb. in forestry, but to be perfectly honest, we have not been in that area until recently, so we're not sure what our recommendations will be in the final analysis. One reason this material is so valuable – we know plants need specifically about 15-20 elements. This material contains at least eight in measurable quantities – a very high number of required elements for products of this nature.

JC: I'd love to hear some anecdotal stories of farmers who have used it.

Dr. O: I have one about roses that's kind of funny. I like roses; I'm a rosarian. My wife and I are both rose judges and rose arrangement judges. An ex-president of the American Rose Society who is a friend of mine – I gave him a bag to use on his miniature roses. His wife had been quite ill – she hadn't been outside the house for a month. Meanwhile, he put this on these miniature roses and when she came out, she immediately asked him, "What in the devil have you been doing to those miniature roses?" They were more abundant and vivid.

In Kansas, we have people who have used it quite a bit. These people raised cattle, and we noticed, for example, that where Planters was used on a wheat field, cows have gotten out and will head for that wheat field just as fast as they can go.

JC: That corresponds with tests I have from Scandinavia, where cows were shown always to go to remineralized fields, if they had a

Dr. H. E. Owen has been with U.S. Soil for 17 years. He has a Ph.D. in Plant Ecology from Oregon State University and taught biology at Ft. Lewis College in Durango, Colorado for over 20 years.

choice, rather than one that wasn't.

Dr. O: We've had corn, for example, up in Minnesota, where they put cattle in the field after they harvest corn, and they could tell where they put Planters – they hadn't put Planters on the whole field – because that's where they would find the cattle. Almost invariably they would be at the end of the field where Planters had been. We see this time after time.

JC: That really says something. Animals seem to know – just like animals go to salt licks for minerals.

Dr. O: You ought to realize animals need exactly the same things plants do. If you had a handful of protoplasm – living material – in your hand, you would not be able to tell if it was plant or animal, because it's essentially the same. If a plant needs these minerals; so do we.

JC: And they know whether they're there or not, and they go for it if they find it.

Dr. O: I don't know how they know it, but I do know they know it. We haven't got sense enough to do that. We'd rather have our junk food.

JC: How many farmers have used Planters II over the years?

Dr. O: Well, we're down right now because agriculture is down, but at least several thousand farmers have used it at one time or another. We've sold it for use in states from Montana to Florida. It's been used in Illinois and Ohio all the way down to New Mexico and every state in between.

JC: It was most impressive that Dr. Bruck decided to use Planters II for the EarthDance Initiative on dying forests on Mt. Mitchell. Were you aware of any experience before with trees or forests? Has it been used, for example, in orchards or small stands of trees?

Dr. O: It's been used in orchards a great deal. For example, a farm in Yakima, Washington in the Columbia River gorge area where they raise apples had trees that just weren't producing at all. They put Planters on it, and the first year they had a 40,000 bushel crop rather than 30,000 – a tremendous response.

JC: Do you know if he was able to avoid using pesticides, because with apple trees they use them often?

Dr. O: I'm not sure. He didn't use chemical fertilizers, I know that. I'm not positive if he used a pesticide or not, in this particular case. We have cases in Washington, though, where they use Planters – and other things, too, organic fertilizers – and don't use pesticides and produce pretty good fruit crops. Apples, cherries, peaches – the whole business.

JC: I've also heard of Planters II being used for thoroughbred race horses, to grow the grass they eat.

Dr. O: I think I know what you're talking about. I'm not familiar with that specific situation, but we do know, for example – and we'll bet our money on it – that any two bales of hay of any type, whether mixed alfalfa and grass, or grass, or straight alfalfa, raised on Planters will replace the nutritional value of three bales of ordinary hay. We find a tremendous increase in protein – 24% protein, for example.

JC: That's tremendous.

Dr. O: I have a case now on vegetables, for example, where we got an 11% increase in sugar in carrots with Planters. We have another piece of data – with Planters and without a pesticide program – there were 3.5 times more microbes in the soil than where the man used chemical fertilizer and pesticides. Another example: in Louisiana, we found protein in grass hay was about 1.5% higher – 9-9.25% versus 7-7.5% – and yield was increased approximately one-third. Then I have data from Minnesota that shows not only protein going up, but also all the minerals going up – more potassium, more calcium – all that sort of thing.

JC: Wonderful. Can you make an economic comparison. I know it will be special in every case, but just more or less the difference in costs between, say, fertilizing with Planters II versus chemical fertilizer, an acre of hay or some other crop.

Dr. O: Yes. A wheat farm in Kansas. We found the wheat yield was 57 bushels per acre as opposed to 35 on the county average. The Planters cost $25 an acre with no chemicals whatsoever used, which gave an increased net profit per acre of $88 – that's not hayseed. Here's a different place – it cost $50 per acre for Planters and yield was something like 82 tons of hay, whereas the chemical acre cost $75 per acre and had a yield of about 82 tons.

JC: It sounds like pretty good incentive for farmers to get out of chemicals.

Dr. O: It's awfully difficult to get people to change. They've been doing it that way for years. It's like the old farmer talking to the young kid, just out of college. "Don't tell me about farming, son. I wore out two of them before you were born!"

JC: Yes, but they can't keep getting worn out, and I think farmers are really starting to realize that. And also beginning to realize the degree to which soil is depleted and poisoned, so I think there's going to be a strong move in the next few years to natural farming.

Dr. O: We certainly hope so. I'm not sure completely organic farming is necessarily the way to go. I do feel strongly we can certainly cut our use of "chemicals" – whatever they are – considerably. We may have to use them occasionally – a little nitrogen fertilizer occasionally – this sort of thing. I think under certain conditions and with certain people – they can go organic completely and do a great job. It may be, though, there are other people who, because of their situation, may not be able to do it completely, but goodness knows we can go way, way back from where we are now.

JC: And really minimize use of chemicals?

Dr. O: Yes. I don't believe necessarily in complete removal of all chemicals, period. But I do believe in a minimum use of it – and I mean minimum – and I think this is reasonable. We've been putting back nitrogen, phosphorus and potash into our agricultural soils, but we haven't put back these trace elements, such as manganese, boron, and so on. This is where Planters comes in – and others.

JC: What do you think is unique about Planters II compared with other rock dust products that are out there?

Dr. O: To be perfectly honest, I'm not familiar with the others, and I don't want to, in any way, denegrate them or anything of that nature.

JC: A strong point about Planters II is that it's one of the oldest ones – one of the earliest – so it has a history of thousands of farmers using it – and pretty successfully.

Dr. O: Yes, we have reams of data. I'd have to get it all out, but I have reams of statistical data, figure data – not just saying I think it looks prettier – that shows it. We know, for example, the eight minerals we guarantee in Planters are needed by plants. This has been proven beyond a shadow of doubt. We've run experiments with Planters that show these elements are available to a plant. A college in Arizona did a big hydroponics experiment for us which compared plants grown in water with Planters dissolved in it with plants grown without Planters. It shows that Planters is available and does increase production of plants. So I think your point is well made. Just the fact that it has been used for so long, so successfully, with definite proof and reams of data that show this is a really important factor.

JC: Tell me about the current status of the company. I understand it was run by one family for about 40 years, then temporarily not in the hands of the family, and now it's back in the family again. What's the strategy now for the way you're going to develop the company – marketing and all. You can mention any distributorship opportunities that are developing

for our readers, because many are very interested in distributing rock dust in their regions.

Dr. O: First, the company is one family owned. There was a time, for various reasons, when the company was leased, with an option to buy, to other people. It didn't work out. They just weren't able to make it go. As a result, Joe E. Lionel, the young man I told you about, has now taken the company back over. He hired me to help build back up our sales force. We're strong believers in direct sales. By direct sales, I mean through distributorships in the field. We find, for example, people want a second income or a little extra money, or they feel strongly this is something they ought to be doing are the people we're after. I'm at present working hard to renew, reinvigorate, redevelop, and enlarge our distributor force. I'm looking for people such as those interested in remineralization, or in organic farming because I think they understand our product best, and I'd love to have people come to me interested in a distributorship. Such distributorships could be anywhere. The further you get from Colorado, the more expensive it is, but it can be used anywhere.

JC: The field is quite open at the moment, since you are just starting to build up distributorships again. So there are good opportunities for interested readers.

Dr. O: Let me tell you my policy. Anybody that wants to be a distributor can contact me and become a distributor. If they show they can sell the product and will order enough over a period of time, we'll then protect their area. But until then, this is wide open for competition. We'd love to have people distribute it, and I think there is a tremendous future in this material simply because, as you said, people are becoming more knowledgeable and desire this kind of product.

JC: I also think although it's more expensive the further you are from Colorado because of transportation cost, it really seems to need much, much less than we normally advocate for other rock dusts, so in fact, the cost of transportation is still considerably less than for many other sources. That certainly seems to be an advantage of Planters II as far as distribution. We advocate, if there's a good source of rock dust in the area, that people use those local materials, but that's not always true and not always available in fine enough grind, and so on. So it seems at this point Planters II is a good possibility for distribution.

Dr. O: I think so, and it's pretty competitive. I think it's also definitely high quality material, too. And you can buy it either as dust – because we do produce the dust to use as a livestock mineral supplement – or you can get pellets, whatever you want.

JC: So a distributor could distribute two products in their area to farmers, both for livestock feed and for agriculture. Tell me a little bit about the livestock feed.

Dr. O: It's called ELX. It's a black powder of this material that you add to livestock food, or you can free choice it – let cattle eat it alone – to serve as a mineral supplement. Most of their foods lack minerals and they need it. We find it works with chickens, for example, and decreases the amount of 'cracks' – eggs have fewer cracks in them. It's used with almost any kind of livestock you can imagine: sheep, cattle, hogs, pigs, chickens. We've even used it in fish ponds, where it's thrown in the fish pond to add minerals to the water. They're both the same price for a fifty-pound bag.

JC: There's one material in Australia I've read pages and pages of testimonials from farmers in terms of domestic animals' health – they have much less mastitis in cows, an incredible difference in health, and so on.

Dr. O: We've had it used a great deal in Wisconsin and Minnesota in dairy herds, and it does greatly increase the health of the herd.

JC: I do know rock dust is used for dairy farms in Austria, as well, so it seems pretty well established. And interestingly, in Austria, they found that after Chernobyl, when they were testing cheese, milk, all foods every day for radioactivity – that cheeses and milk from cows that had rock dust was less radioactive than other milk and cheese. So after Chernobyl, people were very eager to get that cheese, if they were aware of that.

Dr. O: I didn't know that about Austria, to be honest. I do know about the health of animals. That's been verified time after time in herd after herd. Also, it increases butterfat and increases the production of the animal, too.

JC: Has U.S. Soil ever considered the possibility of its material as a nutritional supplement for humans? Obviously, man should get nutrients – and animals also – from plants, but if plants don't have them, rock dust really seems to have interesting results.

Dr. O: We've never actually done it, but I know one customer in Washington who puts a tablespoon in a glass of water, stirs it and drinks it every morning. I know of others who fill empty capsules with ELX dust and take one every day. We've never actually looked into it ourselves. For one, it's very difficult, from a financial point of view, to break into the supplement trade. There's a tremendous amount of competition out there right now.

JC: Also the need for FDA approval. You'd have to go through a lot of steps, probably.

Dr. O: We've gone through FDA before, and it's a little difficult sometimes.

JC: But you might consider that market in the future.

Dr. O: We will. The company's been a little bit down, and we're going to have to build it back on its feet. That's why we need distributors. When we do, we'll look into other things we have in mind.

JC: With it's successful history, the fact that it's just beginning again, it seems like a wonderful opportunity for distributors, so readers should really think about that.

Dr. O: It's a wide open field and we'd love to have it. Right now we're entering the California area and we've sent letters to organic farmers there and contacted some by phone, but they can contact me here directly anytime.

People interested in distributorships can ask for Dr. Herb Owen at 719-539-3535. I'm in the office from 8:00 to 5:00, Monday through Friday, Rocky Mountain time.

JC: Is there anything I haven't thought of you'd like to add information-wise about the product.

Dr. O: I want to emphasize the microbial action. I did mention that we had 3.5 times more microbes. If you increase microbes in the soil, you greatly increase the availablity of all of the nutrients in the soil.

JC: Yes. That's what we stress in the magazine. That's very important.

Dr. O: One more anecdote. A farmer in Wisconsin had a dairy herd and also raised hay. They used to plow their fields, and seagulls would come and eat the worms. They went on a chemical program and, over a period of years, they began to notice the seagulls weren't there anymore. One thing led to another and they found they didn't have any worms in the soil. One of our distributors talked to him and he went off the chemical program, at least mostly, and began to use Planters. His son, in particular, noticed that within three years the seagulls were back, so the worms were back, obviously. It actually occurred. I talked with the gentleman myself.

JC: Well, I think nature is able to tell us so much about what is health and what is not, what is beneficial and what is not. If we would just tune in to all the signs nature gives us, we'd really benefit. I think we're starting to do that more and more.

Tips on Looking for Local Sources of Gravel Dust

by David Miller

I can send readers of ***RE*** list of some of the gravel or rock crushing operations in your area. Chances are that this represents only a partial list of quarries or pits, and I can send you additional names if none of these prove satisfactory as sources of dust.

To make my job of responding to your request easier, I have put together this form letter of suggestions as to how you should proceed. You may have to begin by obtaining the phone number of the pit or quarry from information. I would suggest you then call and make inquiries before you trek out to their location. Following are some of the kinds of questions you should ask to find out if their operation is a likely source of dust which may prove beneficial.

The direct approach works well. Introduce yourself as someone who is researching the potential usefulness of gravel dust as a soil mineral supplement to improve plant growth. Mention that you've obtained their name from you state's mineral producers directory.

Explain that you are looking for a very fine material to add to your soil as a source of plant mineral nutrients. You might want to use the analogy that it is like using powdered limestone, except that you are looking for other nutrients in addition to the calcium or magnesium you get from limestone. You might ask if they crush the gravel, and if so, do they produce fine material as a by-product of that crushing operation? Once crushed, do they wash the gravel? If so, they might call the dust you are interested in by the name of pond sand, pond silt, pond fines, or even swamp sand. The main point here is to find out what they call their dust. Some quarries have their own idiosyncratic name for what we are looking for, and unless you use that word you may not get very far with your inquiries. Dust might be the last word they would use to describe it! Some of the other names I have run across in my travels include: crusher screenings, crusher fines, bug dust, "float", fill sand or flume sand.

Once you are both talking about the same thing, ask them if they have screened the dust to see how much 100 and 200 mesh-size dust it has. If the material in question comes from a washing process and settles in a pond, or if it is concentrated by a vacuum process (sometimes called a cyclone), then chances are it is plenty fine. If not, ask them if they can feel the particles when they rub some between their fingers. A fine 200-mesh dust will not feel granular and will resemble the feel of flour between your fingers. If you have a soil that has a high clay content, it might even be preferable to add a dust that has a greater proportion of coarser particles in it to help loosen the soil. It won't yield as much available nutrients as a 200-mesh dust would, but if the price seems reasonable it is still worth a try. As for price, if their dust is a by-product for which they have little use, it might be as low as $2 or $3 per ton. If they can sell it for other uses, its price might be as high as $6 to $8 per ton. I would recommend trying a pot test, or applying it to only a part of your garden until you have determined that it really is beneficial.

Good luck on your hunt, and keep me posted as to what you find out and what your results are.

Dave Miller
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See page 12 for more information.

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How To Make Topsoil

TRANSFORM GARBAGE INTO GREEN GOLD

To forget how to dig the earth
and tend the soil is to forget ourselves

– Ghandi

by the turtle David Yarrow

"Animal, vegetable, or mineral?"

As kids, most of us played this game. It's how we learned to distinguish the three "Kingdoms of Life" on Earth. But do you know which came first: "Animal, vegetable or mineral?"

Our answer may determine our survival.

Nearly every earthwise person who reinhabits a piece of land will have to bring part of that land back into intensive food production. In most cases, topsoil will be thin, exhausted, acidfiied, sterilized, and weak. An immediate challenge to an earthwise homesteader is to create new, healthy topsoil where there is now none.

Here at Earthwise, quite by accident, we discovered a way to rapidly put poor land into vegetable production, without relying on machines, petroleum or chemicals. You don't even need to till the soil. It's really not new, but an ancient method that's still successfully practiced after thousands of years. It persists because it works.

Last year, we experimented with the idea of teaching urban homeless to live and work on farms. On our trips to New York City to find homeless who wanted to become Earthwise homesteaders, we visited Native Farms, NYC's only all-organic foodstore at 332 E. 11th St. near Tompkins Square Park. There we met Jeff Romano, an eco-activist who helped to plan NYC's Earth Day 1990. After Earth Day, Jeff started his own organic foodstore, and got it open by year's end.

Being eco-conscientious, Jeff hated to throw out his garbage. After all, it's high priced organic fruits and vegetables. Why send it to an incinerator, landfill, or barge to dump in Atlantic Ocean? But no one in Manhattan made compost to turn natural refuse into national resource.

So Jeff put his organic leftovers in plastic garbage bags, and put it in his walk-in freezer, hoping soon NYC, New York state – or someone – will devise a sensible way to dispose of compostable wastes.

Well, summer came and his freezer got full. So Jeff loaded his frozen garbage in a rented truck and drove five hours to Earthwise in upstate NY. (He didn't know he was violating local, state and federal laws – a la "Alice's Restaurant.") We weren't overjoyed at this uninvited, unexpected gift from the Big Apple.

At Earthwise, we have an 18 x 70 foot cinderblock foundation we plan to cover with a greenhouse. But the dirt in this foundation was about our poorest soil – pure glacial till – just sand and rocky fill – no topsoil.

So, our new homesteaders dumped the melting mass from Manhattan out of the bags and spread it inside this foundation. By then, it was no longer fully frozen, and beginning to smell quite rank. So we covered this awful offal with rock dust, lime and composted manure, as much to hide the smell as sight of the gooey garbage. We then went on to other tasks.

Two weeks later, we noticed green shoots sprouting through the manure. These proved to be – not weeds – but vegetables: squash, watermelon, tomato, amaranth, and other edibles. So we left these volunteers to fend for themselves.

Two months later, the whole foundation was overrun with squash and melon vines. The tomatoes struggled to hold their own against this invasion. While our carefully seeded squash struggled along, these wildling squashes grew tall, lush, dark green, and loaded with blossoms.

By September, this unplanned patch was our finest garden. We harvested bushels of squash. Most are green acorns and hybrid summer squash. But the grandest surprise was an albino acorn; these white, silk-skinned fruit enclose tender, rich flavored meat – the taste of waste is a delicate, delicious delight.

One watermelon did outsprint the squash to bear two fruit. The tomatoes – a cherry type – never had a chance, but the amaranth grew to branching bushes of big brushy seed heads.

We gathered an abundant harvest from a plot of sand, without planning to plant a single seed, or ever having to pull one weed. Matter of fact, barely a dozen weeds survived the attack of the squash. In one year, we have total weed control on this patch of now fertile land – and an abundant harvest.

This bit of simple serendipitious wisdom didn't slip past our earthwise awareness. We already recycle homeless humans off the streets into homesteaders on the land. If we're transforming consumers into producers, why not garbage, too? We now have a formula to make fertile soil from urban spoil – and waste is America's fastest growing resource.

Our recipe to recycle garbage into green and gold has four main ingredients:

Garbage: Green plant material is rich in carbon, primarily in the form of sugars in cellulose and starch. Green garbage feeds energy (carbohydrates) to the organisms that ferment organic wastes. Fresh green garbage is full of cells and protoplasm; it's rich, yummy food for microbes and fungi that devour and digest this luscious debris into dark dirt. An abundant supply of moist vegetable matter (including grass clippings) assures accelerated fermentation and humus formation in the heap.

Manure: Compost needs a balance of carbon and nitrogen (C:N ratio) for fermentation to be strong, stable and

If agriculture is to serve the survival of the next generation, we need dramatic changes in strategy from current addictive dependence on oil and machines, to a sustainable, ecologically sensible farming way of life based on stewardship and care. A truly sensible agriculture must have as its first and principal product – not vegetables, grains, fruits, dairy, or meat – but new topsoil. Only if farmers learn to create healthy, fertile fields again will our agriculture continue to feed us and the next generation. And only if the whole community of consumers encourages farmers in this, can this strategy succeed. City and country must join hands to restore the lifecycle to soils.

sustained. Carbon from plants supplies energy (carbohydrates); nitrogen from animals gives amino acids to build proteins, membranes and cell structures. Garbage is carbon; manure supplies needed nitrogen in digestible form. Also, good poop teems with bacteria and other microbial life to innoculate the fermentation and digestion of green vegetable matter.

Rock Dust: Soil is made from rocks. Rock is the parent from which comes the soil's minerals; soil is actually a form of decayed rock. Minerals provide electromagnetic charges to energize the biochemical reactions needed to power plant metabolism. If soil (or compost) has plentiful minerals, all its biological activities are stronger, faster, fuller, richer. Rock dust reinvigorates soil by supplying a glut of easy-to-digest minerals, including trace minerals and micronutrients. As dust, stones are ground to fine powder so their minerals are easily digested by bacteria and other soil life, and thus quickly assimilated into cell protoplasm. Minerals also impart taste to food; mineral rich soil grows vegetables with uncommon flavor.

Lime – a special rock dust – counteracts the acids of decay and fermentation. For life to happen, there must be a balance between acid (+) and alkaline (-); in chemistry, this factor is called *pH*. If soil is too acid, there's a shortage of free electrons and biochemical reactions slow down, and pathological conditions develop. Lime is mostly calcium carbonate (CaCO3). Adding lime to compost sweetens it, and supplies alkalyzing elements – primarily calcium – with free electrons. In today's acid rains, putting lime on soil and compost is ever more important.

Wood ash performs similar service; its akalyzine element is potassium (potash).

Three ingredients of this topsoil recipe are cheap and plentiful: garbage, manure and lime; only rock dust is hard to get. However, it costs to ship garbage from NYC. Besides, eventually the regulators will get wise to our trash-into-cash dream scheme, and intervene. So we looked near to home for organic resource goin' to waste; we found abundance.

Next year we'll definitely continue our experiment with sheet composting. For the winter, we threw layers of leaves and straw on this soil to leave in as spring weed cover.

In 1992, Earthwise homesteaders will grow produce to market to households, stores and restaurants in local towns and distant cities. We'll make a deal with customers: we not only sell you vegetables, but recycle your garbage, too. Kitchen cuttin's and table tossin's mixed with manure, rock dust, ash, and lime make dandy dirt to grow more-better vegies. Square foot by round yard, our land will be covered by reusable refuse.

Properly dumped, a heap of garbage yields three benefits the first year:

- bumper crop of curcurbits
- annihilation of weeds
- living soil suited to certain vegetables.

But really regenerating soil is a five year process, and sheet composting is no quick fix. We accomplished a lot in one year, but we know a lot remains to be do to make truly good, strong topsoil.

Mineral elements in rocks are eaten and digested by living organisms, primarily the simplest *plants and animals*, like bacteria, molds, lichen, algae, and moss. We've all seen boulders covered with lichen and moss. These plants, and even more microscopic creatures, slowly consume rocks, and convert simple, raw elements into complex packages of protoplasm and minerals. Thus, rock slowly decays into soil.

Most of all, it is simple bacteria which dissolve rock and build protoplasm from rock's raw minerals. Finely ground rock powder is a fast-food feast for these microbes, so there is a population explosion of bacteria in soil after dust is applied. Once soil is "alive" in this fundamental sense, all other soil life prospers, too.

Earthworms, too, love dust; they come out at night to lick dust off the ground. Regular light dustings in a garden help to sustain stable earthworm populations.

In fall 1989, I bought 50 lbs. of Planters II dust from U.S. Soils in Colorado to put on my vegetables, herbs and flowers. By accident, my morning glories got an extra heavy dose. I had a little left, so I fed it to my houseplants – just dropped wet chunks of powder on top of the potted soil.

That winter my houseplants came to life and grew more than the entire previous year. This is remarkable, since I live in America's second cloudiest city, and winter is its cloudiest season. Despite scarce sunlight, my plants grew lush – my geraniums bushed out with green leaves and scarlet blossoms.

The next year my flowers bloomed in unequaled abundance, and my herbs grew to stout bushes. The vegetable patch was overrun by squash vines loaded with monstrous fruits. But the real surprise were the morning glories.

In spring, the glories volunteered from their own seed, and quickly spiraled up a fencepost. By early summer, they topped the post – their highest ascent the prior year – and hung down in giddy disarray. So I ran a single wire to a second floor window. Vines twirled rapidly to the window, and grew to thick, hairy strings erupting in profuse blooms all day.

More astonishing was the thousands of seeds I found that fall: one seed had become a thousand. To see plants grow lush leaves and large fruit testifies to fertility, but such extraordinary reproductive vigor reveals the presence of true vitality. This abundant glory of seeds is a genuine testament trumpeting the value of mineral powder to restore life to soil, and everything that lives in and from the soil.

Endless pounds of squash and six foot high heliotrope were great, but the morning glories won me over. Genetic vigor is the fundamental survival trait, and dust did it.

Two issues ago ***RE*** published "Stone Age Agriculture," my article about organic farmer Tom MacDonald's use of gravel dust. Tom, a 15-year veteran of organic farming, never grew such rich tasting, strong, healthy, pest resistant crops as with gravel dust. Dust was so effective he seldom needed other fertilizers once he fed gravel dust to the bacteria living in his soil.

However, Tom was discouraged about getting other farmers to use rock dust. Even organic farmers, despite their ecological concerns, don't understand remineralization. While organic methods focus on soil *organic matter* – which is *animal* and *vegetable* – most organic farmers underestimate, if not completely miss, soil's third, yet primary aspect: *minerals*. They often have a narrow view of minerals, limited to individual elements, (e.g. calcium (Ca), phosphorus (P), potassium (K), zinc (Zn), etc.) Like chemical farmers, organic adherents emphasize four major macronutrients – N, P, K and Ca – and pay too little attention to traces of microminerals.

This is crucial. Food grown in mineral deficient soil will be mineral deficient, too. Therefore, remineralization of farmland must be of highest priority to any program of Earth repair and regeneration.

But, more critical to the whole ecosystem are the trees. Remineralization of forest soils must ultimately be our goal, since trees are the anchors of the ecosystem.

" be earthwise, not clockwise"

12th Annual Ecological Farming Conference

by Don Weaver

I attended the 12th Annual Ecological Farming Conference at Asilomar (Pacific Grove, CA) January 23-25, presented by the Committee for Sustainable Agriculture (POB 1300, Colfax, CA 95713).

Generally, it is clear that *rock dust* is being thought about, talked about and even used more than ever within the *Sustainable Agriculture* movement. I've seen little evidence of interest in it within *mainstream* agriculture. The importance of using the natural rock mixtures like the gravels still does not seem very widely realized among those now thinking *rock dust,* but one would hope this understanding can move forward with increasing speed now that *rock dust* and *minerals* have their feet in the door. (Though we do know single-type rock dusts can be very helpful.)

Bob Cannard Recognized

Bob Cannard, was one of three *successful farmers* invited to speak on what makes them *successful.* Bob spoke of the importance of establishing a complete mineral base using local river gravel fines, then building upon that with on-farm composting, green manuring, weed mulching, etc. The steady quantity and now *famous* quality of his year-round produce combined with the likelihood that he is giving as much or more to the soil than is exiting it, may, in terms of ecological health, make his *successful* label an accurate one. He also seems to earn more than a sufficiency of money. After his talk farmers from Hawaii to the eastern U.S. wanted to know more about remineralization.

The Lubke Farm in Austria

Successful may also be accurate for the Lubke farm in Peuerbach, Austria. Uta and Siegfried Lubke, gave two long talks with slides, *Controlled Microbial Composting as the Basis for Regeneration of Soil Fertility* and *Soils, Microbiology and Composting: A European Approach.*

I'd first read of the Lubke's biodynamic farm and on-farm lab in a 1985 issue of *Acres, USA,* and reported on it in *Solar Age or Ice Age? Bulletin* 9 in 1987. It described the use of local rock dust, in addition to compost, raised the soil microbe count from about 50,000 to 3-4 billion per gram. Uta said they generally use, and recommend to those they teach around Europe, 2-20 lbs. of rock dust per cubic yard of compost, if one is doing pile or windrow composting. They use diabase (basaltic) rock dust obtained free from a quarry. In discussions I mentioned to Uta that if they could find a mixed rock source their results would likely be even better. I asked her if she recalled receiving a gift of *The Survival of Civilization* (given to many farmers in the U.S. and other countries) a few years ago. A little later Siegfried thanked me for the book and other materials; he had read and appreciated it and apologized for not having yet responded, stating it would take him *a book* to reply, but he was working on it! And he promised to send some papers in the meantime. Uta wanted to send me some of their compost innoculant mix of 58 kinds of soil microbes. They were very nice, sincere and obviously had a deep dedication to the health of the soil.

I also appreciated the invitation to visit their farm. After seeing the slide showing the rise in their soil's organic matter content from about 2-3% to about 7-10%, I very much wanted to visit and find out if I too could plunge my long arm *up to the elbow* as their very alive soil in season allows. I told Uta how impressive I thought their organic matter rise was, generally unheard of in this country, and she said, "Oh yes, and those were old slides; we now have some soils up to 14%-33% on an experimental basis." A lot of farmers and gardeners use a lot of compost and green manure, but from my studies it is rare for the soil not to oxidize down to 5% or less organic matter. I think the consistent use of rock dust makes the big difference on the Lubke farm. One organic farmer I know said he wants to add 3" of gravel dust to his whole 10-acre farm. He too was impressed by the Lubke's organic matter rise, and said, "Yeah, and they also can grow four crops a year. I can only grow one."

Also remarkable was how the Lubke farm was able to move through the Chernobyl contamination crisis in 1986 with apparent minimal damage due to the abundance of life in the soil. (See the December '89 and April '90 *Acres, USA* for the full Lubke interviews. August '85 was the first Lubke story.) The Lubke's address is A4722 Peuerbach, Untererleinsbach 1, Austria.

Phil Callahan on "Growth Improvement"

Phil Callahan, author of *Tuning In To Nature,* showed slides of major growth improvements in rock dust-nourished plants he had grown, and showed one of a farmer's field where 10 tons/acre was spread by tractor to one strip of potatoes. These potato plants were shown still green and healthy a month after the rest of the field had died back. The dusted strip had 0% culls vs. 20% from the rest of the field. The source of the rock dust was not specified.

BRIX Readings

Dan Skow, an author and farm consultant in Minnesota who studied with Carey Reams and continues his approach to increasing the *energy* in the soil, (fertilizing largely with seaweed and fish concentrates and phosphate rock), also gave a presentation. One instrument he uses and recommends is the refractometer, which indicates the percentage of sugar and minerals as supplied by the BRIX reading. High BRIX crops generally are fully resistant to insects, disease initiation and are highly nutritious and tasty. When I asked him about the value of fertilizing with natural rock powders such as in the glacial meltwater of the Hunzakuts, he said, sure, that's great. In fact he knew one farmer in Idaho who used that accidentally on one of his fields and got a great crop. And how were the energy and BRIX reading in soil and crop? They were very high, he responded, in his loud and forceful manner, up around 16-18% BRIX. And that farmer was wondering if he shouldn't maybe fertilize his other fields the same way, he added with a laugh! One had to wonder if consultant Dan Skow had been fully open to the implications of the Idaho demonstration of gravel dust fertilization, as well as previous reports he'd received on the subject.

SR Networking and Notes

Naturally, other SR "networking" was done, and an information corner was set up which included some samples of the latest two ***RE.*** These and other info were quickly absorbed by the crowd of about 850. I see that the subject of rock dusts has broken into the *9th Annual California Farm Conference,* February 7-9 in Santa Rosa, CA. It was rightly included in the workshop *Soil Fertility – The Sustainable Approach.*

Acres, USA has re-published *Bread From Stones* by Julius Hensel, "with a forward based on Notes by John Hamaker, Don Weaver and Larry Ephron, and an afterword by Philip S. Callahan." (Free catalog from Acres, USA Bookstore, Box 9547, Kansas City, MO 64133.) I think it is well done.

Seeds of Change provides an educational catalog and organic seeds from their New Mexico farm. I note in the culture instructions for Pascal Giant Celery: "Fertilize heavily with compost, green sand and rock dust." A little more progress for the mineral "kindom" in its ascent to full participation in the Evolution of the Gaiasphere - but there is still lots of room for acceleration! (Seeds of Change, 621 Old Santa Fe Trail, #10, Santa Fe, NM 87501. Catalog $3.00.)

Synergy Seeds

by George Stevens

My introduction to the concept of remineralisation came three years onto an organic farmstead enterprise in Northern California's lovely Capay Valley. I was listening to Michael Pilarsky delivering a lengthy dissertation on *The Survival of Civilization* as we rode home from the '83 Ecological Farming Conference at LaHonda. Two days of continuous rain later, after putting him on the bus to Washington, I returned to witness the devastation of flooding and erosion which had transported about 20,000 cubic yards of alluvial topsoil along with trees and double-dug beds of herbs and vegetables downstream from my farm toward the Cache Creek Settling Basin near Sacramento.

Before long I had met Don Weaver, and after a great deal of encouragement from Mark Chass and others I slowly began to experiment with rock powders, in addition to the regenerative practices I was already following. These were producing the remarkable high quality fruits, nuts and vegetables for which my Arbor Vitae Farm became well known. In 1988 Rainer Pawlitski joined in, and with direct assistance from Ulrike Weidner we conducted pot tests and field trials on a number of locally available materials which showed promising preliminary results.

However, the camera containing film verifying the test plot arrangement was stolen, the local ground squirrel population boomed and began devouring perhaps $3000 worth of lettuce, beets and carrots, and the little remaining evidence was accidentally harvested off before measurable data could be salvaged. Nevertheless, I went on to purchase 25 tons of one of the source materials, then incorporated into compost windrows which were carefully prepared for use in orchard, vegetable and seedcrop plots in several locations during the next two seasons. I was convinced that remineralisation was a practical regenerative technique, but my six-year long struggle with the eroding streambank finally forced me to choose my deepening work with the seeds through *Synergy Seeds,* and to seek out a more conducive environment for the natural farming which I have been learning to practice.

Coevolutionary Gardening is a wholistic approach to the gene pool which is non-hierarchical and easily employed by gardeners to observe, assess and assist the plants in their natural and cultivated settings. Alan Kapuler of Peace Seeds, CG's principal proponent, is fine tuning the international taxonomic system for the plant "KIN-dom" to provide graphic models of the evolving relationships inherent in the Families, Genera and Species. As a grower using this system, I have been able to probe the underlying integrity of the biosphere which has been depleted and defeated by modern agriculture. The process begins with the seeds: when you learn to follow the natural pattern of plant life through maturation to flowering and seed production, the development of natural farming cycles becomes self-evident. Observing a wide variety of species from diverse families enables one to understand the environmental factors and corresponding plant growth, and to provide needed input.

In order to assess the feasibility of remineralization for your individual location, here are a few questions you must consider:

How will the material be transported to the site, and in what quantity; What spreading method and range of application rates will be used; How much labor will be required, and fuel, equipment wear and tear to get the job done? What is the optimal time of year for spreading when compaction or other impacts can be minimized; Is it feasible to combine rock dust with other soil amendments to be applied in order to save energy and reduce compaction, etc.? What other operations will you be performing, and how does that relate to rock dust. And of course, when and how to apply for the maximum feeding capability for the living soil. After you consider all these factors, you can draft a simple cost analysis to fine tune the rate of application, and design experimental plots to verify cost effectiveness.

A few additional tips from my experience: If you perform replicated applications, do so in several ranges of 1x, 2x, 3x to provide the best chance of seeing differences. Stagger the check plots in an offset pattern so the different materials/rates can be compared side by side, and take into consideration any natural variations in the subsoil or terrain for the orientation of the blocks or rows. Accurate records and durable markings are essential, as well as protection from animal predation, if you are to see differences in the long term. Finally, it's very important to employ as many different plant family members as possible, because they all have more or less specific requirements and are acclimatized to widely varied conditions. This is where the Coevolutionary Gardening system can be put to work.

Great gains will be made in nutrition and efficiency as more growers put this practice to use. We will learn to be less consumptive, competitive and wasteful of resources in providing for our basic needs, and begin to enhance, restore and experience the natural beauty and exuberance of life all around us.

- ◆ Learn to save your own seeds, collect the many kinds in nature and discover their attributes and utilitarian qualities.
- ◆ Plan for more diversity in your gardening efforts: our primary vulnerability at this time is over-reliance on too few plant families for our sustenance.
- ◆ Develop networks to exchange surplus locally, regionally and globally.
- ◆ Learn about the natives of your region, and act for the preservation of habitat and threatened species — we are losing them at an ever-increasing rate.
- ◆ Keep good records of your work and share the information; this will become the basis for AGREEculture of the future.

For a *free specials* list and to order the Synergy Seed Catalog ($1.00), call my voice mail number. In the U.S.A. call 1-800-925-2512 and in California call 1-800-655-5569.

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From Famine To Feast

Algae can play a key role in regenerating our planet

by Kimberlee Jaslowski

Algae is playing a key role in the race to regenerate our precious planet. It will also provide reference to the importance of minerals and their catalytic ability to create life-sustaining or life-threatening algae growth. Perhaps most importantly, it will point to the great hope which algae holds as a primary food source for our starving world.

Algae are present in nearly every water body on Earth, from arctic to equatorial seas, from glacial lakes to the morning dew. To say our lives depend upon algae is not an overstatement. Ninety percent of the oxygen in our atmosphere has been and is being generated by algae. They represent the foundation of the food chain, creating nutrients needed by all other forms of life. They convert minerals, water and sunlight into edible vitamin/mineral complexes, amino acid chains, enzymes, chlorophyll and just enough fiber to hold everything together.

Many human populations throughout history have employed algae as a staple food. For centuries the peoples of Africa, South America and Asia have included fresh and salt water varieties in their diets. Relics from ancient civilizations show algae cakes buried in sand pits or stored in clay jars. There is good reason to believe that the "manna from Heaven" gathered by the Israelites in exodus from Egypt was a type of algae. The Bible says the manna was gathered from the morning dew and served as bread to sustain the people and their animals.

At present, human interest in algae is experiencing a revival. The EarthRise Company, Cell Tech, Inc. and Royal Sun have spearheaded the movement towards using technology to propagate, harvest and distribute algae for human and animal consumption. Each company has contributed unique new methods, which combined together could make algae the choice cuisine for the 90s and beyond. Numerous groups, including the EPA are looking into using algae as an environmental detoxifier and regenerator. Following Mother Nature's lead, these groups have discovered that algae can purify both water and air. Acting as a catch for pollutants, they become a disposable holding station. When not forced to perform this sacrificial act, algae can exchange CO^2 for oxygen at a rate 200 to 500 times faster than trees.

An excellent example of a variety of algae which appears to be a miraculous gift of Nature can be found

Relics from ancient civilizations show algae cakes buried in sand pits or stored in clay jars.

in Lake Klamath, Oregon. Here we find the "*Aphanizominon* phenomenon". The pristine lake environment, located in the heart of the Cascadian Mountain Range, offers a superb ecosystem in which *aphanizominon flos aquae* (lovingly dubbed Super Blue Green Algae) can flourish. Cell Tech, Inc. was founded in 1983 for the purpose of harvesting and distributing Super Blue Green Algae. After a fifteen-year computerized search for the "perfect food", Harvard graduate and Cell Tech founder Daryl Kollman settled on Super Blue Green. He found the Klamath Lake algae to contain more essential nutrients than any other single whole food. Its cell wall is so thin that the proteins, vitamins, minerals, chlorophyll, etc. contained are considered 95%-100% assimilable. In contrast, animal proteins range from 5%–25%, while plant sources such as soybeans are only 40–50% assimilable unless juiced or isolated.

Pure water, sunlight, glacial silt and volcanic rock dust are the keys to the apanizominon phenomenon. Over 80 different minerals and trace elements have been found in the lake bed, constantly replenished by glacial rivers. This organic mix fuels the algae population, which turns out an annual yield of tremendous proportions. Hundreds of tons of algae can be produced from a single acre of water/land space. Cell Tech's harvesting, freeze-drying and packaging techniques represent a very low impact/high output operation compared with any other food industry. The company promotes container recycling, bulk packaging and network marketing to lower consumer costs, and donates 10% of its Super Blue Green Algae to famine relief.

Thousands of people across the U.S. and Canada are realizing the benefits of eating this wholesome food, frequently reporting increased energy and mental clarity, heightened resistance to stress and disease and relief from symptomatic illness. The American Cancer Society is studying the algae because of its high beta-carotene and chlorophyll content, both of which have been found to prevent cancer.

The EarthRise Company and Royal Sun Spirulina both use commercial propagation techniques for growing algae. Both companies grow spirulina, a variety of algae which can be propagated more easily then *aphanizominon flos aquae*, and which contains a similar nutrient profile in a less concentrated form (1 gram of *aphanizominon* contains the RDA of essential amino acids compared to 5 grams of spirulina). The spirulina is grown in cement, steel or plastic ponds, kept at a temperature between 86-95° F (29.4 – 35° C), is centrifugally circulated and sustained with select mineral compounds. As at Cell Tech, Inc., the water purity and processing facilities are continually inspected for purity and must conform with FDA/USDA guidelines. Eighteen minerals are required for healthy spirulina growth, though it is likely that experimentation is being done with broader spectrum rock dusts in an attempt to increase the balance of nutrients and the growth rate of the spirulina.

All three companies offer educational programs, which include lessons on the health and economic implications of employing algae as a primary food source. Royal Sun, under the direction of its parent company Unisyn, has gone straight to the cause of one of our nations biggest dilemmas. They have built an aquaculture/greenhouse project right in the middle of a livestock farm. By doing so, Royal Sun has demonstrated that cattle slurry can be converted into methane gas for powering the propagation of algae. This solves two major problems. By recycling the cow dung, nitrogen and other concentrations of potentially harmful bacterial, viral and toxic chemical residues are kept from entering the ground water. By growing spirulina, farmers and consumers alike can experience the resource savings obtained by producing food from algae instead of meat and dairy products. Another

Clodbuster Takes Less Energy To Produce

by Leland Taylor

I studied the "minerals" chapter in the current *State of the World* report by Worldwatch. That writer emphasized that mining caused much of the pollution because of the tremendous amount of energy used. His tables showed that gravel production and limestone quarrying used much less energy than did the mining and processing of the "metals".

When producing Clod Buster, because it is soft and even "air slakes", (thus powerful grinding equipment is not needed) even less energy is needed to produce it than producing gravel and limestone require.

When producing *Clod Buster*, because it is soft and even "air slakes," (thus powerful grinding equipment is not needed) even less energy is needed to produce it than producing gravel and limestone require. Pulverizing gravel multiplies the energy use.

Worldwatch barely `mentioned the use of minerals for fertilizing.

84-year old Morris Lee Clark, Des Moines, Iowa, gambled $29.50 to obtain 50# of *Rico Verde* (by UPS). *Rico Verde* is the scientifically formulated lawn and garden fertilizer which contains "adequate (amounts) of all essential plant foods, in plant-assimilable forms. He treated 60 tomato plants – and sold $600 worth of tomatoes from those 60 vines. "The vines were absolutely loaded when an October heavy freeze hit," Mr. Clark told Herb Ide, Waterloo, while picking up 22 bags "So I can enjoy similar improvements with my entire retirement garden."

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continued from previous page

discovery, made at the Royal Sun site on the island of Ohahu, Hawaii, is that algae blooms, occurring in nearby waterways which were once used for slurry run-offs, became manageable after the dumping was stopped. It has been known for years that algae overgrowth can cause suffocation of other aquatic life; the missing link was the fact that algae overgrowth occurs most commonly in waters polluted by agricultural waste.

So yes, algae, when given the proper balance of minerals, pure water, air and sunlight, can offer the world a great hope for the future. Daryl Kollman of Cell Tech, Inc. has stated that greening an area the size of the state of Colorado in algae ponds could compensate for the CO_2 imbalance in our atmosphere. To accomplish this by planting trees would require an area five times the size of the U.S. The ponds could also provide food for billions of people and animals. From the largest whales to the smallest microbes, all creatures rely on algae to survive. Though it may seem a humbling experience to switch from a steak dinner to a gram of algae, the benefits gained will more than compensate for the readjustment.

Call my algae hotline, 1-800-927-2527, ext. 579 for additional information, to place orders for Super Blue Green Algae, and arrange for educational seminars to be held in your vicinity.

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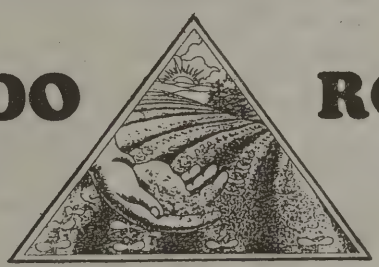

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WHAT'S NEW ON THE CYCLONE CRUSHER

The Cyclone is the most affordable, high quality, mobile and small scale industrial crusher on the market

by Lee Poindexter

I appreciate the opportunity to critique and update some of the original Cyclone information as it was originally disseminated. In reading back through the article that appeared in your Summer-Fall issue, I do agree that some rewording and clarification is in order.

First, though, I would like to briefly share the evolution of the Cyclone. The basic physical principle around which the Cyclone works is centrifugal force, which has existed since the beginning of creation, and is utilized by many products and applications. Although there are also other proprietary factors involved in the design, it was, in fact, classified military research in the utilization of gravitational forces that served as the foundation for the Cyclone's initial development.

The current development phase of this specific product has also been relatively long, dating back into the mid-80s. By late 1990, prototypes had been manufactured and were being tested. The next step in the process was to turn the marketing people loose to start promotion and sales. At this point, a mistake was made in the selection of the marketing organization. The company noted in your first article, although well-intentioned, did not have a technically-oriented staff and was not experienced in equipment sales.

Upon restructuring the organization in mid-1991, the Cyclone team now includes a total of two engineers and people experienced in heavy equipment and equipment applications. As may be expected, this change also brought about more technological improvements and additional prototype testing.

Going back to your original article, it was stated that "...the Cyclone, which can handle all kinds of rock, minerals and glass, reducing it to any selected size from .25" to .325 microns." Then, under general features, it was noted that the machine is "adjustable to produce material as large as .25" or as small as .325 microns (powder)," and that the "end product is uniform in size, without impurities."

> For those readers who would like to have a 5-gal. sample crushed for their own tests, our company would be happy to do so at no charge, providing a gradation analysis and and estimated production rate. The material will be returned freight collect.

Without any question, the above statements should never have been printed the way they were. Although the Cyclone will produce material that will pass a #400 screen, only a small portion, usually about 10% will do so. If a #100 screen size is required, it is our experience that the percentage passing will vary from 40% to 60%, depending on a number of factors.

The terminology "uniform in size" has also been confusing. In the aggregate business, and according to the Bureau of Reclamation's "Earth Manual," a uniform gradation "is a good representation of all particle sizes from largest to smallest." Yet, to some people, it has meant that all of the particles are of the same size.

To overcome the above problem, we took special care to present a gradation chart of several typical material runs, clearly defining the samples, how the Cyclone was set, what the production rates were, and what the output gradation rates were.

In talking to a number of individuals around the country with interests in remineralization, we have observed a very wide variance as to what gradation of rock dust is most desirable. Some feel that a well-graded material from #30 to #400 is the best. At the other end are those who desire 90% to 100% passing a #200 screen.

Being a machinery company, we do not have a position in the above debate, if there is indeed, a correct answer. However, we feel very comfortable in offering a high quality machine that will process many rock sources to 90% in the #30 down to #400 range. For those desiring 100% passing a #100 or a #200, this can be accomplished by screening and recirculation. Though there are milling machines that can meet these requirements, they are machines with many times the initial costs and substantially higher operating expenses.

As your publication well proves, the industry of remineralization still has many more questions than answers.

Rock Dust Gradation Sizes

I would like to present to you some observations about material gradations.

First, in talking with a number of potential clients, we find that almost no one, outside of the aggregate and mining industries, has a feel for the significance of mesh screen gradations under #16. Without exception, everyone seems to believe that various materials are finer than they actually are. Even one of your authors, when feeling a #30 to #200 grind felt that material was all minus #200.

In reading through your publication, I note the same problem. In many cases a detailed test is run, with numerous scientific observations, yet no mention is made of the gradation of the rock dust used.

Another point is that a particle passing a #200 screen is so small that it is not visible to the naked eye. Yet if a particle is so small that it cannot be seen, it must be very academic as to when such a particle is fully consumed by microbes.

In another instance, a test was conducted on 1/8-inch rock particles used in composting. The results, as related to us, were that the 1/8" particles were totally consumed by a hot compost mix in six months time.

Although we have no answers, it appears this might be a topic worth researching and reporting.

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A Gardener Goes for Gravel Dust

by Howard Warren Elmer

After learning about the Hamaker Theory, my first goal was to get my hands on some gravel/rock dust. Needless to say, my garden loved it more than my hands! Last year I did some vegetable gardening, and applied several different materials from different sources to some plots. I have to state here that my techniques were more garage oriented than scientific, but still, positive results were evident.

In general, my observations were that the germination rate in the plots used with gravel dust applied according to Hamaker's criteria was high; almost every seed I planted came up strong. A plot with sand didn't have quite the same germination rate, but wasn't bad. In this respect, the control was not as good. The growth rate in the test plots seemed faster than that of the control, and plants in these plots grew hardier upon maturity.

Foliage-wise, some mature varieties in the tests showed a deeper color and a more intricate development in the curves and folds of the leaves as compared to the control.

Lastly, some edibles from the test plots had a slightly sweeter, more robust taste compared to the control.

As I continued to accumulate and munch upon the results, I became assured that Hamaker was really onto something, and began to get a vision of distributing affordable bulk quantities of material. Further research brought about the formation of the *Mosaic Soil Company*, which now operates out of four locations across the States and one in Canada. By region these are the West, Midwest, South, Northeast and Ontario-Quebec.

My thanks go out to Larry Ephron and his impacting film *Stopping the Coming Ice Age*, the film's companion book, *The End*, and subsequently to John Hamaker. Also to numerous other people in the chain of concern, many of whom I was put in touch with through the resourceful Don Weaver, all who have helped bear in the birth of *Mosaic*.

M S C

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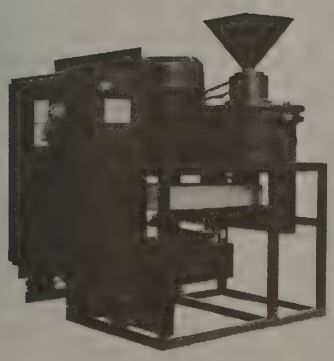

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A BULLETIN
FROM THE EARTH REGENERATION SOCIETY

Support the New Climate Bill with a CO_2 Budget that integrates climate and remineralization, food and jobs. Bring down CO_2, stabilize the climate, regenerate the Earth and create jobs at the same time.

by Alden Bryant

Emergency Climate Stabilization and Earth Regeneration Act of 1992

HR 4154 was put into the U.S. House of Representatives on February 4, 1992, by Representative Ronald V. Dellums. The full title of the "climate" bill is *Emergency Climate Stabilization and Earth Regeneration Act of 1992.*

This is the first document at a government level setting forth a program for climate stabilization. It sets forth a structure: the amount of carbon to take out of the world's atmosphere in the next 15 years. The goal is to bring the atmospheric carbon dioxide count down from the current 355 (or more) parts per million to around 280 ppm. This is called the "livable level".

The bill calls for the U.S. to take part in a global effort. The central working tool for this emergency effort is the "CO_2 Budget": a work plan for every sector of the economy, a full employment program, a transition program to keep people working during the conversion from military to climate stabilization work on forests, soil, alternative energy technology construction, conservation, pollution cleanup, and meeting basic social conditions.

February 4, 1992 is the start of a new era in human history. It is the first call at a government level for a balance between the Earth and the atmosphere and continued human survival. Climate destabilization is killing crops through drought, heat, storms and freezing at a rate that leaves us few years to attempt to bring the conditions under control. Other aspects of our daily lives are also threatened at an increasing rate.

This bulletin is to advise you of HR 4154 and ask for your help in reaching the media, other organizations, the public at large and to send letters to all members of Congress to support passage of this bill on an "emergency" basis. Your dollar contributions to the *Earth Regeneration Society* (tax-deductible) will pay for the educational effort involved.

Background

This bill can provide a new impetus to develop a U.S. integrated jobs program covering social, pollution and climate emergencies. This bill integrates climate, food and jobs. This bill means our survival. All sectors of the U.S. economy are involved.

The operating technology of our society is threatened by the extremes of climate change; our very way of life is changing.

We know that in the history of our world there have been approximately 20 to 25 glacial periods, in the range of 70,000 to 120,000 years each. During the last glacial period the ice extended down to Wisconsin and New York in the northern Hemisphere.

In the 1970s a number of scientists were pointing out that we are now near the end of the present interglacial period. The CIA Research section had a study prepared in 1974 showing that climate was changing and food supplies would be knocked out, resulting in destabilization of governments. The job of the CIA was to inform Congress of what was taking place.

In 1977 Gifford Miller was on a television program pointing out that, from the evidence, the Earth is moving into the next glacial period. This understanding is further substantiated in the article by Gifford H. Miller and Anne de Vernal in *Nature*, January 16, 1992.

This century is the time of rapid change:

- soil minerals are depleted near the surface of the ground
- forests are gone, dying, burning and pest infested
- atmospheric carbon dioxide is rising rapidly
- some ocean areas need iron for a blooming of phytoplankton, which removes atmospheric carbon dioxide
- snow and ice are increasing in the higher latitudes

These five physical realities, which determine most of the current rapid climate change, we refer to as "the environmental pentagon".

We, in the U.S., have for over 15 years been hit by ever more extreme heat and drought in the more southern states, forest fires, freezing conditions in the winters, storms, hurricanes, earthquakes and volcanic action, all of which add up to impacting human life through loss of crops, homes, utilities, transportation, including inability to get to work (e.g., the blizzard in Buffalo, New York, for 44 days in 1977).

Our goal is survival – crops continuing to grow in the temperate zones of the world, the maintenance of human life. Our goal is to achieve a balance between the earth and the atmosphere, to maintain life as we have known it. Reduce the atmospheric carbon dioxide, CO_2 by 170 billion tons in the world, from 355 parts per million to 280 ppm over the next 15 years. This is the goal.

CO_2 is now 355 parts per million or more. As long as it is above 280 ppm (the approximate level at the beginning of the century) the climate extremes will keep getting worse. What do we all see: The increasing heat and drought in the lower latitudes evaporates more water. When the warm, moist air arrives in higher, colder latitudes the moisture condenses. More clouds, snow and ice are the result. We are living in a fast-moving time with hot air masses coming up from the South, freezing attacks coming from the North, and the climate going crazy in the middle. The rate of destruction is accelerating. Our crops will be more and more seriously threatened over the next 15 years. There may be almost none by that time. This is our emergency. The whole world is facing this.

In response, we call for a CO_2 budget for our country, and will cooperate with all other countries to do the same. A CO_2 budget is a work plan, showing the impact of every part of our lives on the CO_2 level. You plant forests, you take out CO_2. You improve the mineral quality of the soil, and thereby the enzyme, microbial content, and you grow healthier crops (for human health) no longer needing pesticides, crops withstanding

BOB CANNARD

by Alden Bryant

The following excerpts are from an interview with organic farmer Bob Cannard on January 30, 1992.

On Enzymes

Enzymes are byproducts of microbal life. All of their interaction goes into getting the mineral particles into the plant roots. All life in the soil structures the soil, and changes it from clay, or whatever the original parent mass is – into what we recognize as topsoil.

Creating Food for Microorganisms

Now of course these micro-organisms need other foods than just the mineral nutrients. They also need carbon and they need a nutrient source. This is the fuel source. This is the stored sunlight that is formed in the photosynthetic process in the establishment of the higher plant. The higher plant aids the micro-organism population by photosynthesizing and fixing atmospheric carbon into its body and storing sunlight in this carbonaceous chain and molecular structure. As that plant dies and loses body parts, leaves or whole plants, depending on circumstance, it goes into the soil surface and is now food for the micro-organisms. The micro-organism population, and earthworms and all other soil life as well, consume this carbonaceous material and have bodily wastes which are acidic, and this is where the acid-alkali exchange occurs.

Soils Plants and Nutrition

The soil life cannot survive without the plant and the plant cannot survive without the soil life. And neither of them can survive without adequate and full-spectrum balanced mineral nutrient sources.

And it needs to occur directly on the soil surface so that the soil becomes granulated and can have good air-water exchange right from the soil surface. So at first you have a little thin crust of good soil, or topsoil, and progressively as the cropping system, whatever it may be, increases the depth of topsoil it also increases the quantity of mineral nutrients that are held in cycles in the system.

If plants are limited by any one of the four (sunlight, air with its carbon, CO_2 and nitrogen, minerals, soil life), the plants are less efficient, don't reach their genetic potential and are subject to incomplete growth and various types of pests.

Increasing the Life Support Potential with Rock Dust

As you increase mineral content in soil systems – the life support potential – then you also increase the capacity of the soil to absorb atmospheric nitrogen and get it to enter into the biotic chain as well.

We can use both massive 'crop dusting' and 'forest dusting' with rock dust for remineralization.

Acid rains produce one of the big problems with the forests in industrialized zones. These acid rains flush through the soil and do mass acidulation or mass leaching of the solublized mineral nutrient level in the soil, and make it progressively more difficult for the plant life, whether it is in a cropping system or a forest system. Whatever kind of a living system it is, it can benefit from renewed surface mineral nutrients.

Nature doesn't have the capacity, other than through mass erosion such as occurs under glaciation, river flooding or dust storms. Mechanical methods of nature are limited in being able to spread new minerals in a uniform manner over land; and it is quite difficult for nature to renew something that has lost its balance. This is where we can go out with the tools and the forces that humanity has at hand. We can recognize this limit in nature and we can go to various mineral sources – both igneous and basaltic rock – to create our own solution."

drought, freezing and pests much better – no longer needing pesticides which poison people, the soil and the water supplies.

This is known as remineralizing the soil with finely ground rock dust together with organic material (steer manure, decaying plants, etc.). Many farmers are doing this and have shown results for 15 to 20 years. The same holds true for forests. Rock dust plus organic material have brought dying forests back to life in Europe, Australia, Asia, as well as in the U.S.

A CO_2 budget is an economic plan for a country, or a region within a country. This is a work plan reaching out across a range of jobs; in reforestation, in remineralizing soil, in build – a world in which climate change can be contained if we can bring down the CO_2 count in time (other "greenhouse" gasses are a lesser problem, but still have to be reduced). We see these things going on all around us. We know it is happening. We must act – for our own immediate survival.

This Bill Proposes to:

- Call for a national CO_2 budget for the U.S.
- Call for a work plan designed to reduce the CO_2 level in the U.S. and take a responsible role in reducing the CO_2 level in the world as a whole.
- Prepare an analysis of CO_2 impact from all economic activities in the U.S.
- Set CO_2 goals for the U.S.
- Measure climate change impact, the losses from all climate extremes, over a past period (ten years) to more fully understand the increasing rate of destruction.
- Establish CO_2 Councils to ensure broad citizen participation, planning and implementation of CO_2 budget work plans.

It is essential, therefore, to pass this bill *immediately* to get work going on the scale needed. This will be our approach in the campaign to follow, and the compelling public demand as increasing numbers of people become aware of the nature and speed of climate change.

Alden Bryant is President of the Earth Regeneration Society.

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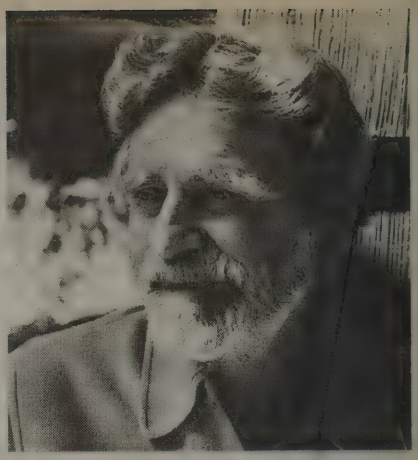
Rock Dusts For Human Nutrition

by Harvey Lisle



Those who practice soil remineralization have to be very caring. We care about our Mother Earth and do what we can to help heal her. But for a little while, instead of turning our thoughts outwards on how we can help heal our Mother Earth, lets turn our thoughts inwards on how we can help heal ourselves, improving our own health and happiness. We have an excellent tool, "living rock dusts", which taken internally will go a long way towards healing ourselves.

For years I was a chemist at the Brookside Research Laboratory in New Knoxville, Ohio. At that time in the 1960s there were only two soil conditioners based on rock dusts. One was Planters Soil Conditioner and the other was MicroMin, now known as FloraStim, both still around. While they were promoted as soil conditioners, many farmers were feeding them to their livestock. I worked with Cliff Meyer, sales manager for Planters Soil Conditioner, and Ike Falb, sales manager for MicroMin. Planters is a silicate rock rich in sulfur, while MicroMin is a marcasite clay rich in silica and sulfur. We know that these materials were doing a good job in treating the soil and promoting good nutrition in the livestock, but we scratched our heads in vain searching for the reason.

It was only several years ago that I finally discovered what made these two rock dusts so valuable in treating soils, animals and humans. It turns out that there are a number of other rock dusts which will do as well.

Let's turn our attention for a moment to Rudolph Steiner, the founder of Biodynamic Agriculture. One of Steiner's teachings was that lime and silica are polarities, and upon these two is based the physical reality of our Mother Earth. All of the rock dusts which I will term *living rock dusts* are rich in silica. The *living rock dusts* channel forces from the Cosmic. If the Cosmic is living, then these rock dusts are living. Most rock dusts do not channel these forces, so as far as I am concerned they are dead, and I won't have much to say about them.

In Biodynamic Agriculture we have preparations which channel forces from the Cosmic, so I am very familiar with these forces. How do I determine that there are forces in the Biodynamic preparation? I am a dowser. Dowsing is essentially the detection of forces. When we dowse for water we are dowsing for the forces caused by movement of water through the ground.

When I first suspected that some of our rock dusts had forces in them, it was a simple step to dowse for these forces. At last, after many years, I know the secret of Planters and Micromin. They have the Cosmic forces. I then turned my attention to other well-known rock dusts such as Azomite, basalt, Clod Buster, Dynamin, diatomaceous earth, taconite, Pascalite, NutriCarb and Promin. Aha! We now know their secret: they are channelers of Cosmic forces.

But there are many, many other *living rock dusts*. Maybe that quarry down the road from you has *living rock dust*. Scarcely a week goes by but some other sample of rock dust comes in with the question, is this a *living rock dust*? Sometimes the answer is yes and sometimes it is no.

So, let's back up a little. How do these *living rock dusts* condition the soil? The Earth is a living entity. It breathes, has a circulatory system, has nerves which we dowsers term energy lines, etc. The Earth breathes out in the morning and in the evening breathes in. Our *living rock dusts* enhance this function since they, too, breathe. The result is that the soil improves in texture. It becomes friable. The moisture metabolism works more efficiently. The soil absorbs moisture more readily and retains it longer.

I apply them to my land every year, especially now that our weather has become chaotic. 1988 was the worst drought year in Ohio's history. 1991 was even worse than 1988 in our section of Ohio. I consider my *living rock dusts* my drought insurance. In spite of the drought, 1991 was the best fruit year I have ever had. My fruit trees– apples, pears, plums, peaches and cherries– were loaded with nice fruit. These *living rock dusts* draw in moisture from the air for both the soil and the crops grown in that soil.

A caution: Chemicals will absolutely kill the good effects of the *living rock dusts*. Chemicals are electrolytes, and electrolytes destroy the capacitance1 function of a good soil. Without the capacitance function of the soil, the *living rock dusts* will not work.

When I was working at Brookside, I would go out on the farms where they were feeding either Planters or MicroMin to their livestock. Invariably the animals would be alert, with glossy coats and shining eyes. What promotes glossy coats? Silica. What promotes shining eyes? Silica. What promotes alertness? Silica. The livestock might be eating the *living rock dusts* as mineral supplements, or they might be eating the crops grown using these *living rock dusts*. Either way or both ways, the results were the same.

What is good for livestock should be good for humans. Physiologically, we aren't that much different from animals. Yet you won't find Planters or

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At the conclusion of W.W.II, back in civilian life, my wife told me that she wanted an organic garden. Those were the days when Lady Eve Balfour, Sir Albert Howard, J.I. Rodale, Dr. William Albrecht and Dr. Royal Lee were our teachers. This was an extremely important milestone in my career, as biodynamics deals with forces, and I started thinking about and dealing with forces in my gardening activities. The next milestone came circa 1960 when I went to work for Brookside Research Laboratories. That adds up to approximately 30 years working with rock dusts.

The next year of significance was 1984, when my wife and I joined the ACRES, USA group in touring Egypt and Greece. The highlight of the Greek tour was Epidaurus, a famous amphitheater dating back to before the time of Hippocrates, who practiced medicine there. We had several excellent dowsers in our group, who through their dowsing ability discovered that there were extremely great forces emanating from the stage area. Up until this time I knew practically nothing about dowsing. I borrowed a dowsing rod to determine what I could discern about the forces. When the dowsing rod nearly twisted out of my hands, I became a believer and a dowser. That was the key. Now I had a means to detect and measure the forces involved in biodynamic agriculture, and in the use of our "living rock dusts".

Harvey Lisle

FloraStim or Azomite or the rest of them making any claims for human nutrition. They don't dare, for the Food and Drug Administration would put them out of business.

I claim that these *living rock dusts* are enzymes in the truest sense of the word, and are one of the best. What are enzymes? Let's go to the dictionary: "Any of various organic substances that are produced in plant and animal cells and cause change in other substances by catalytic action". I will wager you still don't know what an enzyme is because you don't understand what catalytic action is. No one does. It is the same with electricity. We all know what electricity will do, but we don't know what electricity *is*. We know what enzymes will do, but we don't know what enzymes *are*.

Electricity is not a material thing–it is an energy which we don't understand. Enzymes are not material substances, but are forces which we don't understand. The *living rock dusts* are the channels for these forces, or enzymes. These forces are capable of causing wonderful changes in the soil, in animals and in us.

We have learned that enzymes are found in proteins in combination with various minerals, namely calcium, magnesium, manganese, iron, copper, zinc, cobalt, boron, sulfur, phosphorous and maybe several others. These are the same minerals we call "trace minerals", so important for health. Could it be a coincidence that the important trace minerals are involved in channeling the enzymatic forces to us? I hardly think so.

Now, one more quantum leap. Science has told us that enzymes are found in proteins. True. But I claim that enzymes are also found in some silica-bearing rock dusts. I fall back on Rudolph Steiner for this claim. The significant element in protein is nitrogen. Steiner tells us that nitrogen is an astral element, or the element of the stars, or the Cosmic element. But silica is also an astral element, or Cosmic element.

One of the beauties of silica is that it is not affected by heat as are proteins. Enzymes associated with proteins are destroyed at approximately 117°F because proteins are heat labile 2. When we cook our food the enzymes are destroyed. This is the main reason why some people eat only raw foods, and it is a fact that such people usually enjoy excellent health with no degenerative diseases. They get all of the enzymes present in the food. When I eat raw foods I get their enzymes, but now I can get enzymes in some of my cooked foods, by putting in a little *living rock dust*. So far, the foods into which I have incorporated these dusts are my own baked bread and cooked cereal. They now have silica-based enzymes, unaffected by heat. Although I have chosen bread and cereal, there is no reason the *living rock dusts* couldn't go into any food of your choice, or be taken by themselves. In bread and cereal, however, I can't taste them, nor detect any grittiness, which suits me fine.

How much to take? First, I would refer you to the book *Secrets of the Soil* (P. Tomkins and C. Bird, Harper & Row, 1989). Chapter 17 is devoted to Azomite. The advocate is a 93-year old man, Rollin Anderson, who has been mining Azomite since World War II days, and takes a teaspoon full with every meal. Azomite is a montmorillonite clay with many trace minerals. In Chapter 16 we read about Robert Schindele, an Austrian, who discovered the rock dust currently being used to restore the dying forests of Europe. It is a most fascinating story which you rock dust people should know. Schindele takes two teaspoons of his rock dust, which he calls Superbiomin, daily. He indicates its effectiveness by pointing to his hair, which has recovered some of its youthful color. I was given a sample of Superbiomin, which certainly does have those living forces. No wonder the dying forests are recovering. Life in the dusts promotes life in the trees.

Closer to home is John Hamaker of Michigan, who relates in his book, *The Survival of Civilization* (Hamaker-Weaver Publishers, 1982), on page 34, that he takes from one-fourth to one-half teaspoon of gravel dust daily. He started taking it to find out if it would relieve his chronic constipation, which it did.

Coming back to myself, I dowsed that the right amount for me was one-fourth teaspoon per day. I have also heard of a wholistic physician who determined that one-fourth to one-half teaspoon per day was right for him. Keep in mind that what is right for me may not be right for you, but this should give you enough information that you can determine the best amount for yourself. I will emphasize *dust*, chock full of good silica-based enzymes.

Our skin is a vital organ, and silica is one of its very important elements. Silica promotes strong bones. Every school child is taught that calcium is required for strong bones. Again, as in the soil, silica is the forgotten element. If I had to choose between calcium and silica, I would choose silica. Have you ever seen a picture of the beautiful structural beams and trusses in the human femur? These are silica, not calcium. There is more calcium than silica in our bones, and it is mostly the calcium which fills in the structures. But it is silica which comprises the structures and contributes most of the strength.

I have always enjoyed good health, but even as I stated earlier that I like the *living rock dusts* as drought insurance for my land, so do I like the *living rock dusts* as health insurance for my body. At the very least, I am going to have strong bones and a healthy skin.

Since there are many *living rock dusts* represented in the pages of *Remineralize the Earth*, I would prefer that those of you interested in taking one, pick the dust most favored by you. I think they are all are good, but for those of you who don't know the dusts and would prefer a suggestion, I would suggest Azomite, Elemite, or Pascalite. They all have been been approved by the FDA under GRAS (generally regarded as safe). That assurance may give you a little more faith in their safety. Azomite and Elemite have a volcanic origin. Elemite was previously called Azomite. The original Azomite company was sold to Peak Minerals. Pascalite is a bentonite clay mined in the Big Horn Mountains of Wyoming. (See Gravel Sources in this issue for their addresses.)

1 *Capacitance*, as I have used it is the ability of a soil to collect and hold on to electrical charges. All life has electrical components, and capacitance is one of the electrical components of a good soil.

2 *Heat Labile*: A labile food or food component is subject to rapid change or deterioration. A heat-labile protein, then, is one which is subject to rapid change when heat is applied

How to test for life in rock dusts

You are all familiar with how algae and lichens will grow on rocks. Although I haven't done the experiment myself, I will quote Herman Meinke, who reported the experiment in the November, 1991 issue of *Acres, USA*. "To check rock dust, take dead distilled water, shake in about one teaspoon per quart in a glass jar. Place the mixture in the sun. The completely dead rock dust won't grow algae, whereas the most alive rock dust will produce algae growth within three days. Even a tablespoon of this living rock dust will turn a swimming pool into algae soup." Can you visualize this same microbial action taking place in your intestines in a matter of a few minutes? The *living rock dusts* promote life in whatever milieu they find themselves.

Trace Minerals, Bio-Availability and Testing

by St: Toepfer

As a new knowledge base matures, concerns emerge that must be addressed. To go from remineralization concepts to practical application, new challenges have surfaced which will ultimately be handled by creative, inventive individuals, new knowledge and time.

With increased interest in rock dust, many new companies and individuals are jumping on the bandwagon under an "environmental" banner whose products have marginal reason to be in the market other than to provide the marketers cash profits. Many products have had little or no testing, no history of how they work over time in various situations and to what degree, plus no indication what the dominant, active, filler, and missing ingredients are. Many have no indication if they even meet minimum qualifications of various state fertilizer laws. Rock varies considerably from deposit to deposit, so there must be a system to provide users adequate information. Someone will be making regulations shortly concerning rock dust, and probably they won't be based on knowledge or logic, but rather on vested political interest. Few lay people have the background to "sort and sift" the various rock dusts beginning to show up in the market. So a classification system needs to be developed immediately.

Another concern is that most mountainous regions, particularly where there's mining or other rock disturbances, have a multitude of problems. For example, arsenic, mercury and cyanide frequently flow out of mines and tailings to then contaminate watersheds and aquifers. Stones from these areas made into rock dust could have the same problems.

Rock varies considerably from deposit to deposit, so there must be a system to provide users adequate information.

Reprocessed or recycled rock dusts from manufacturing or sludge operations have added challenges of heavy metals and an assortment of toxins. Marketers of these products tend to say as little as possible for as long as possible because of the very expense of getting toxins out. A company that has a vested interest in a product can easily finance a grant to any lab or university and come up with "bonafide" research to "prove" the product works with little or no toxic effects. This misrepresented, deceitful and dishonest technique has been done from the beginning of time. We who have been around research for any period of time know the ease with which tests can be weighted to support whoever provides the funding.

With the U.S. Environmental Protection Agency (EPA) tightening up on polluters, many manufacturing, quarry and mine owners are looking for creative ways to dump polluting byproducts into the market for a profit rather than a liability. An example of using a toxic by-product to make a profit are aluminum smelters (the raw material is from a rock called bauxite) in Washington State in the 30s and 40s having highly toxic Fluoric Acid in monstrous, leaking tanks. This was a major problem even before "pollution" became a buzz word. State and federal political maneuvering made it legal to dump fluoride in water supplies, toothpaste and food in amounts supposedly too small to hurt anyone — supposedly to fix everyone's teeth. This fluoride maneuver was so clouded by vested interests we many never in our life find out the truth, although from what little we do know, it appears to be a total scam.

Another example of turning toxic product into profit is the increasing bombardment of our food by radioactive isotope by-products under the innocuous word "irradiation". The original radioactive material incidentally came from stones ground up into dust, with one side effect of creating environmental blight all over the world where these materials are mined.

An example in the quarry industry is the dust called "fines" from grinding and crushing operations that falls through belts and cracks in machinery. This is increasingly addressed by the EPA because it is polluting countrysides and roadsides. These owners would love to spread this material around for a profit, with no regard for the environment or whether it works as "rock dust".

The U.S. Forest Service did lots of research 20 to 25 years ago on typical rock dust from limestone quarries to adjust pH, and dropped the idea when they found the benefit was minimal with several side effects, and the tonnage volume was greater than practical manpower and money.

St: Toepfer was born at home, located on a glacier till of the Rocky Mt. of Colorado. Educated as a conceptional engineer and high tech entrepreneur, scientist. Current quest entails gaining insights into new alternative Fourth Wave paradigms to assist in current changes upon this beautiful planet called Earth.

Taking Responsibility – Contributing What We Can

by Dan Hemenway

First, readers should examine St: Toepfer's article very carefully. He articulates many legitimate concerns.

Second, I caution readers to question rigorously anyone who proposes that "experts" do our thinking for us. That state of affairs has permitted environmental degradation to go unchecked for so long. Scientific research is useful as a servant of the greater powers of intellect, often lumped together (usually for purposes of dismissal) as "intuitive" or "psychic."

Readers should know St: Toepfer works for a company that sells a soft rock mineral, so much of his writing is as self-serving as the claims of rock powder purveyors he criticizes. I submit there's nothing wrong with self-serving data, whether St: Toepfer's, or nameless others he criticizes, as long as it's true,

Scientific method... is at best incomplete and often misleading to predict ecological interactions. Predicting ecological interactions is what we're about if we are to classify and evaluate potential performance of rock powders.

responsible, relevant, and useful. These four tests suffice.

Perhaps as an outcome of St: Toepfer's contribution, ***RE*** might establish a new department to evaluate rock powder products. This, of course, requires some source of funding to conduct necessary trials. These could, in part, be based on St: Toepfer's recommendations, though in my view substantial modifications are required to make them at once less simplistic and less expensive.

Now to particulars.

Scientific method, particularly tests outlined by St: Toepfer, is at best incomplete and often misleading to predict ecological interactions. Predicting ecological interactions is what we're about if we are to classify and evaluate potential performance of rock powders. Let me exemplify.

Suppose we evaluate rock powders in the greenhouse. For simplicity, we say

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The one dimensional view that anyone can grind up the nearest rock into ultra fine powder, then apply it heavily to soil to solve all the damage done by pollutants is far too simplistic and naive. There are ramifications, like bio-availibility and the knowledge base created by adequate testing and screens.

Mother Nature puts out a very wide assortment of rocks. Silicates and feldspars are the most plentiful and readily available, although relatively inert for bio-availibility. Several different rocks and kelps offer far better trace mineral bio-availability, with each offering varied degrees of bio-availability. Altered ancient freshwater marine bogs seem to be the best found so far. Also, several rocks are highly toxic, like arsenic and cinnabar, which have a long history of causing problems even to this day.

Orthoclase feldspar, for example, has lots of potassium in the chemical analysis which seems beneficial to trees, plants and microbes, yet it just isn't readily available for a very long time period. The time frame we humans have on this planet for survival is vastly different than the thousands to perhaps a million years it takes to break down feldspars.

It seems if there's iron deficiency in soil, grinding up red sandstones, which have iron in chemical analysis, will resolve the matter. However, red sandstones are basically inert silicates, with a form of iron not readily available for microbial action or plants.

Or perhaps for iron deficiency use Limonite (commonly called Bog Iron) with a very high chemical iron analysis. Yet plants immersed in Limonite are stunted or die of iron deficiency, plus little microbes have a rough time.

To adjust excess acid, it seems calcium will do the job. Limestone and Dolomite are more bio-available than silicates or feldspars, and the most readily available source for calcium. A multitude of quarries, usually within short distances, would solve the shipping challenge. Current recommendations say to put 1000 to 4000 pounds on soil or lakes per acre, depending on the level of acidity, and if that doesn't work, increase the volume and frequency of application. Heavy application of limestone/dolomite generally builds up extreme levels of magnesium and calcium in a form that throws most everything out of balance, making phosphorus, zinc and iron unavailable, and developing toxic magnesium levels. The sheer volume of all that weight really makes it impractical from an energy, financial and manpower perspective.

There appears to be a relationship between bio-availability and hardness. Harder stones like silicates and feldspars take far longer to become available to plants and microbial action than softer types. Grinding smaller does expose greater surface area. However, if the stone is basically inert, then increasing application rates or frequency of application isn't the solution.

Walking on any glacier till, an interesting observation is that glaciers in ages past seem to have already ground up most softer, more beneficial, bio-available rocks, leaving hard, less bio-available reject stones piled up.

As bio-availability decreases, application rates per acre increase in an attempt to offset this. When application rates go beyond 1000 or 2000+ lbs. per acre, shipping, grinding and actual application costs become far less viable. The more the material is bio-available, application rates become more manageable, in the 150 to 500 lbs per acre range, with optimum around 250 lbs. per acre. This makes the economics far more attractive.

Past research from a chemical point of view shows the necessary role for plant growth and development of major essential elements: nitrogen, phosphorus, potassium, sulfur, calcium, and magnesium. Research on essential micronutrients (or trace minerals) is largely limited to manganese, iron, boron, zinc, copper, molybdenum, and cobalt.

With elements researched thus far, it's

continued next page

Four Stages of Screens & Tests

In simple terms, the generally accepted screens and tests are:

Stage I

In Stage I, we're looking for any bio result — good or bad. People who run screens should never know what the material is or from where. This blind testing gives far better testing results.

Three to five of each "test organ or samples" are used for controls and test substances. Results of each "screen" are recorded at significance levels of 95- 97%

Stage I screens determine if there's any activity on a living thing, be it a microbe, plant or insect, and that there's not more than 5% chance of error. In visual observation of any living being there's a 50% chance of error. Only by numbers and careful testing can this chance of error be reduced to something meaningful. Everything, including rock dust, needs to at least pass through Stage I screen before it's put in the ecosystem. Perhaps rock dusts can do things that haven't been screened for. Perhaps the claims made are not real, and money is wasted, or worse, a substance is distributed into the environment that's harmful and toxic. Not all *natural* things are beneficial.

Basic Screen

Test five samples of each: gram+ and gram- bacteria, plant fungi, human fungi, common yeast, and pathogenic yeast.

At the 95% or 97% level, was there any activity? Did the gram- bacteria show inhibition? Did the common yeast grow? etc. If increase or decrease at the 95% confidence level occurred, the compound will go to Stage 2.

Greenhouse/Environment Chamber

Test sample five controls and five each of the test compounds: legumes, grass and two weeds common to the specific geographic area. Was there any difference in the test pots between control and the test compound at the 95% confidence level? If yes, go to Stage 2.

Insectary

Test sample five controls and five each of the test compounds: weevils, mealworm larvi and *Lepidopetra* larvi.

Did anything happen to the insects? If anything occurred, died, grew better, or deformed at the 95% confidence level, go to Stage 2.

Stage 2

Do comprehensive chemical and physical analysis, along with acute toxicology tests and mutagenetic studies for worker safety, including, but not limited to: atomic absorption, mass spectrometer, visible, IR, UV, Nuclear Magnetic Resonance (nmr), Gas Chromatography (GC) and High Pressure Liquid Chromatography (HPLC).

Stage 3

Where there was activity from Stage I, do a liquid culture for time release study and availability on every element of activity. Then change dosage levels for separate ranges into different activities of 1/4, 1/2, 2x and 4x, with one being the unit. Work at 97% confidence level.

Where activity occurs in the beginning Stage 3 at the 1/4, 1/2, 2x and 4x dosage levels, change the dosage levels into finer and finer ranges of 1/10ths (milli/ microgram per liter) to discover the optimum amount. Work at 97% confidence level, which is only a 3% error. Additionally, what effect do these finer dosages have on different soil types?

Next, do expanded toxicology studies and computer simulations, which include skin and eye irration, and mutagenetic agents tests within Stage 3.

Simple mineral tests generally stop at this point, with pesticide tests and the like going on further with fish, wildlife and insect studies, all within the same parameters of Stage 3.

Stage 4

Field work studies in actual field plots. From the knowledge base formed in Stages 1, 2 and 3, field work has real value. To skip directly to Stage 4 has far less value than when the knowledge base is in place.

St: Toepfer

St: Toepfer continued

recognized that any one of these elements can limit growth and development. When one element is missing or low for what plant or microbial action needs, it inhibits the total result. All nutrients needed for healthy plant growth must be present in balance to allow a plant to reach maximum potential. Growth limits are encountered when a deficiency in any one essential micro- or macro-nutrient occurs. A plant or animal will develop only to the extent the limiting concentration will allow. This is called the "Law of the Minimum."

Sadly, research on the rest of the micronutrients is largely nonexistent for plant and microbial growth and development. Any one of these, singly or synergistically with others, could be yet another limiting factor, or perhaps the magic answer. In addition to practical considerations of bio-availability, testing must determine whether a product works or not, and to what degree.

The usual research determinations for a product's viability before it's put into the ecosystem are composed of four basic screens, or tests (see sidebar). In several cases, rock dusts showing up in the market skipped the first three, or all four, of the screens. It appears thus far only three rock dusts in the U.S. have undergone extensive testing, with one being only for human consumption. To run one or two mass spectrometer tests and say "mine is better because it has 81 elements" misses the issue. A single test says very little because testing anomalies happen frequently. By running all four screens, various anomalies sort themselves out and real answers emerge as to how well it really works, and to what degree.

For several products, the only testing consists of just two pots, where pot #1 has regular soil (whatever that is) and pot #2 has two spoonfulls of rock dust, then watch one plant grow six inches and the other twelve inches. This misses most of the screens to find out how well finely ground rock really works, and to what degree. This pot test might fall into Stage 4, bypassing the knowledge base formed in Stages 1, 2 and 3.

What elements in pot #1 are major, missing or out of balance. What causes it to grow only six inches? Would three spoonfuls of rock dust in pot #2, instead of two, be excessive and reach a toxic level? Is the usual high level of aluminum in feldspar toxic, and to what degree? What were microbial action levels in pot #1 and #2. Was pot #1 microbe population low because it was closer to a cool winter window which dropped the temperature ten degrees. Cooler soils adversely affect microbes' ability to synergistically work with the nutritional process. Each drop of 10 degrees C reduces biological action by 1/3 to 1/2. Or conversely, each increase of 10 degrees C doubles or triples biological action, which includes microbial activity between 0-30 degrees C.

Perhaps the shovelful of soil for pot #2 had castings of eight earthworms in it. This increased nitrogen levels, which would easily explain the twelve inch growth. The extra growth may not have had anything to do with the two spoonfuls of rock dust.

What if pot #1 and #2 had very acid soil caused by acid rain and other pollutants which are a common problem on the planet? Ground up brown Lignite coal dust (Leonardite Ore, commonly called Humic Acid) was applied to pot #2. The sulfur in the coal dust works great on alkaline soils in the Southwest U.S., so how come the plant in pot #2 grew only six inches? What about all the other ingredients in Lignite? Are they inert, or toxic, or do they really work like "Humate" sales brochures say?

How come the material called Humic Acid, which typically only occurs in a seam of 1 to 3 inches thick, is mixed with all the brown Lignite that does virtually nothing and is sold as being all Humic Acids? What is the real story about this material, or do mine owners and distributors have such vested interest in the product that weasel wording in sales brochures is all we ever get? Perhaps a bag of brown coal dust is just that — a bag of brown coal dust!! It isn't the first time in history gold was traded for a lump of coal!

To bypass accepted screening and testing before a product gets in the market and the ecosystem will only bring mishaps because of the lack of knowledge base for each product, and give a black eye to the fledgling remineralization concept.

If, for example, an orchard dies and blame is placed on the application of rock dust, there's very little recourse when the knowledge base is incomplete. Had there been a knowledge base, it would be easy to spot the rapidly deteriorating, out-of-balance nature of the orchard that was already 9/10 dead before the rock dust application. With a knowledge base in place, it's easier to understand that what the orchard grower had abused over the years couldn't be fixed by any product, incantation or magic potion — ever. Rock dust was a last ditch attempt to rescue the orchard, and what the grower really got was a scapegoat to blame rather than accepting his own wanton neglect, mismanagement and misapplication of chemicals over years.

We need a simple rock dust classification system where time-based bio-availibility to microbes and plants is recognized, maybe as a result of Stage 1 and 3 screens. We could perhaps set up parameters along these lines: Bio-Availibility 1 (BA1), where nutrients are available to the plants and microbial action within 30 days in moist soil; maybe BA2 would be bio-available in six months, BA3 in one year, BA4 in three years, BA5 in ten years, BA6 in 100 years, BA7 in 1000 years, and BA8 in million+ years.

In addition, we need to quantify the different materials in each product. If the buyer pays for 3/4 inert silicates or feldspars which are BA8 and 1/4 at BA1, then the buyer needs to know this. Shipping and nutrient costs would be easier to calculate at BA8-75% and BA1-25%.

There are also practical basic questions that need to be asked. How much filler is added to a product? Is the product blended with other manufactured chemicals? What's the major ingredient? What's missing in the ingredients? Do ingredients match what's really needed for the soil it's going to be applied, to the best of our current knowledge? What's the product's track record? Does it even come up to the minimum qualifications of state fertilizer laws?

The remineralization concept at some point will come under state and federal regulations. Either we establish standards, or a politician with vested interest in chemical industries and a strong agricultural chemical bias will create unconscionable regulations for us.

Additional questions need to be explored. What about alternative growing modalities beyond the chemical approach? To what degree do these alternatives work or not? Could they work synergistically with other techniques? A growing number of people have first hand experience to indicate these modalities do work, and quite successfully. Perhaps simple answers were with us all along and no one paid attention because it was out of the "norm". Who would think grinding clear quartz, then stuffing it in a cow horn will increase photosynthesis when applied to a field or crop in a specific manner? Yet thousands of Bio-Dynamic growers around the planet use this and other alternatives on a regular basis with incredible success.

Another area that holds great promise is propagation and farming of micronutrient sea kelps and fresh water, blue-green micronutrient algae called aphanizomenon flos-aquae. Kelps and algaes don't weigh as much as rock dust, and grow most anywhere, which can make remineralization far easier. So, many questions are yet to be answered concerning micronutrients in rock dust. Simple solutions to the world's challenges may be just a thought away.

Another frustrating observation — with a dose of humor — is that research, testimonials and historical effectiveness can be shown with regard to microbial action, trace minerals and balance, yet seldom do these forms of communication convey the message. The questions, in spite of past knowledge, typically are

St: Toepfer continued

"Will my plants grow taller, produce more and make me more money? Will trace minerals cost nothing, shipping be free and work on soil even if it stays in the barn? Nothing you've shown me so far proves anything. You plant it in my field for two or three years, get the local chemical-biased ag agent to agree, and pay the university to do all kinds of tests. Perhaps then I'll see about using trace minerals." Inventing the wheel over and over again is like trying to push the river upstream.

Since WWII, billions of dollars supporting chemical farming worked to educate generations of humanity to believe the chemical approach is the only and best way. Yet it's easy to notice what's going on around us so silently. Read Rachel Carson's newly reprinted classic *Silent Spring*.

The cosmic egg is slowly cracking as Permaculture, Bio-Dynamics, Biointensive, Organic, Radionic, Homeopathic, sound and light frequencies, thought power, electromagnetic, vortex, eloptic, prana forces, and other modalities are explored with viable success beyond the norm of chemical approaches. Plus, soil research based on natural balance concepts from the late 1800s to WWII is still available. This gold mine of information is still relevant, but largely overlooked and deemed invalid.

In our rush to provide our salaries, food and shelter under the guise of helping the planet, the basics of testing and categorizing modalities, options and degrees thereof, get shoved under the carpet to disappear from immediate view. Ultimately this results in no one winning and the planet continuing to deteriorate.

Granted everyone would like to believe the simple solution to our beloved Earth's dilemma is to just spread around any ole rock dust. This simplistic, one dimensional view overlooks what must transpire to realize the vision. It will take lots of research, money, time, and people power. Most of us recognize that our collective wisdom, experience and energies can facilitate our vision. Conversely, being secretive, competitive, or back stabbing can cancel out most of our positive efforts. Only by synergistic, collective efforts will we effect our desired vision of a clean, beautiful planet.

Yes, there is hope. Perhaps with a little bit more time, we'll find the wisdom and solutions.

I wish to thank Herb Owen, PhD, Joe E. Lionelle, Robert I. Bruck, PhD, the owners or managers of several micronutrient products in North America, and a host of authors for the wealth of knowledge and support for this article.

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they're effective or not to promote healthy growth in standard greenhouse plants.

First, let's say rock powders are effective. What soil mix is being used? Are its deficiencies the same as those in your forest, where you wish to diminish pollution damage? Probably not.

The multi-stage research suggested is a bureaucrat's heaven, but too expensive for the 80% of the world's population who don't live in industrialized countries, and also for many of us who do. What we want to know is: "Does the stuff work in our conditions?"

Are mycorrhizal fungi in greenhouse soil the same as those in the forest? Fungi are critical in the release of minerals from stones to green vascular plants. Many such fungi only associate with a certain group vascular plants, or with just one species. It's likely not all species, or even strains, of mycorrhizae are equally adept at releasing minerals from rocks, and that ability will vary among species depending on the particular rock.

Is soil pH in the greenhouse the same as in your forest? As St: Toepfer observes, mineral availability varies with pH. Low pH (acid) makes aluminum soluble, killing fungi needed by (or extremely useful to, depending on circumstances) trees and other plants. While aluminum could, indeed, come from rock powder itself, as St: Toepfer suggests, it's also very common in soils anyway. But at higher pH values, it usually stabilizes in insoluble forms that are harmless to plants. So a rock powder demonstrate a benefit in the greenhouse might result in neutral or even negative result in the field. Besides aluminum, heavy metals in rock powder or in soil can be "activated" by acid precipitation.

Likewise, greenhouse tests showing a given powder to be useless may have no bearing in the field, where, in some circumstances, it could be beneficial. Trace minerals commonly are critical ingredients in enzymes. Nature is conservative. Enzymes needed to counteract specific stresses may not be made if stress, say attack from a pathological fungus, doesn't happen. So healthy, unstressed plants in the greenhouse don't need mineral X because they don't make enzyme X. But in nature, where pathogens may attack a tree already weakened by other human-induced stresses (e.g. climate shift), mineral X may spell the difference between survival and death.

As St: Toepfer hints, in some circumstances, mineral X combined with mineral Y may have the desired benefit. For example, enzyme XY may require them both. Like human medicines, minerals useful in dilute quantities may be toxic in excess. A trace mineral in soil can be like aspirin in a medicine chest — relevant only in times of distress, but needed on hand against such times.

Timeliness itself can be a factor in the usefulness of rock powders. A rock powder application on my forest today may have no effect, whereas it may have made a major difference five years ago before all the mycorrhizal fungi where killed. The ineffectiveness of ground limestone on declining forests may be due to this "medicine for the dead" situation.

Research on rock powders, above and beyond conventional NPK fertilizers readily available in concentrated form, is principally relevant if done in conditions as close as practical to those where the particular rock powder is to be applied. In the U.S. (granted a very small fraction of the planet), every state has agricultural research stations, often associated with institutions which also have forestry departments. Field research using, first, rock powders from the nearest likely source, can evaluate their effectiveness as soil amendments for local purposes, forest and/or agricultural. Research stations are well equipped to also evaluate the usefulness of the method and conditions of application as well.

The multi-stage research St: Toepfer suggests is a bureaucrat's heaven, but too expensive for the 80% of the world's population who don't live in industrialized countries, and also for many of us who do. What we want to know is: "Does the stuff work in our conditions?"

St: Toepfer rightly points out we also want to know: "Is the stuff poisonous?" I was marginally involved with folks in London, Ontario interested in a kiln dust which showed promise, but might contain heavy metals. Interestingly, it was the kiln operator who cautioned that heavy metals may be a problem. If heavy metals are less concentrated than those in soil, of course rock dust dilutes them anyway. Some soft rock powders, notably phosphate rock, are by-products of uranium mining and may be somewhat radioactive.

There are some distributors of rock products who we may not wish to support. Association of phosphate rock and uranium reminds me of Kerr-McGee, implicated in the death of nuclear industry activist Karen Silkwood, sells lots of rock phosphate to the organic movement. Vulcan Chemicals, source of absolutely horrendous chemical pollution in Wichita, Kansas and a major U.S. polluter with ozone-destroying chemicals, is part of the same corporation as Vulcan Minerals — a company seeking to

Sorting Out the Issues...

by Don Weaver

I think the author should specify which companies and individuals he knows are marketing rock dusts with "marginal reason to be in the market other than to provide the marketers cash profits." Would he provide evidence to prove this claim? It sounds as though he has researched them very thoroughly.

Will he elaborate his perception of the correct relationship between rock dust qualities (of course, Nature generally uses mixed rock or gravel dust to create naturally fertile soils) and state fertilizer laws?

There is, of course, variation in the element content of mixed gravels. Great variations, however, will be found between what he calls "any ole rock dust" and another. Who does he think recommends unquestioning use of "any ole rock dust"?

I agree it's wise to be careful of contamination of gravel deposits, soils, food, air, water, and the environment generally where toxic materials may be nearby (most everywhere), including those associated with mining ores.

Would the author specify the "reprocessed or recycled rock dusts" whose marketers' intentions of deception are known to him? If he will help the Soil Remineralization Network avoid uninformed use of materials he knows have excessive heavy metals and an assortment of toxins, it seems helpful to identify the operations he is thinking of.

That quarry and gravel pit owners want to sell all their products and byproducts doesn't mean what they have necessarily compares to fluoride and radioactive materials. What the author ... labels "polluting"... may be excellent soil mineralizer if handled intelligently.

I tend to agree with his thinking on fluoridation and irradiation.

That quarry and gravel pit owners want to sell their products and byproducts doesn't mean what they have necessarily compares to fluoride and radioactive materials. What the author (and perhaps EPA) labels "polluting" (usually if air-entrained) may be excellent soil mineralizer if handled intelligently. If the materials in question aren't pure gravel dust, then everything present must be considered to determine whether ecological poisons, nutrients or neutral materials are present.

The significance of the U.S. Forest Service study with lime rock dust isn't made clear. Gravel dust remineralization intends to provide all the biologically essential rock-borne elements to the soil life-system which has many essential jobs in the Bio/Gaiasphere. "Adjusting pH" is only one. Building high levels of soil fertility and ecosystem health when given the opportunity appears to be what they consider practical and within their powers. Too bad the Forest Service has yet to see the value of entering into a conscious, constructive partnership with Nature's underground workforce.

Webster's dictionary defines inert as "having inertia; without power to move or resist an opposing force... with few or no active properties; neutral". I think this is why microorganisms are needed to actively work on inert and inorganic rock materials in order for soil to be created. Life builds the organic from inorganic, originally, and "bio-availability" is determined by fineness of the rocky substrate, presence of other life needs (adequate air, water, temperature, carbon, nitrogen, etc.), and presence of natural micro-flora and fauna. "Bio-availability" according to lab tests doesn't necessarily reflect what will occur in a living soil.

Don Weaver is co-author with John Hamaker of *The Survival of Civilization* and has *The Solar or Ice Age? Bulletin.* See *Resource* section for more info.

Dan Hemenway continued

supply rock powders for soil amendment. I think we should boycott Vulcan Minerals and tell them why. Maybe they can add internal corporate pressure to bring their Chemical Division colleagues around to responsible and humane practices.

In discussing the costliness of transporting large quantities of rock dust, necessitated by slow rates of availability of the dust of hard rocks, St: Toepfer neglects to mention that a slow rate of availability means less frequent applications are needed. If extraction enterprises aren't conducted, one application may suffice on the human time scale. Moreover, in many areas where rock dust might mitigate effects of extreme pollution, including acid rain, promising rock (glacial gravel) is right at hand. What is needed, is temporary services of a portable rock grinder. Let's keep transportation to a minimum by using local resources to the extent they're effective. In summary, I agree with many of St: Toepfer's concerns, but disagree with his remedy: reliance on the scientific elite. We should increase individual responsibility in all aspects of life — particularly in Western society where we've defaulted too long to the best minds money can buy.

I propose efforts to develop a people's research program, begun already in these pages, be continued, and that we all take responsibility to contribute what we can. The fate of the biosphere, or our particular bioregions, is too important to leave solely in the hands of scientists. We will stumble and sometimes fail at the effort to develop a new, populist research methodology. This is counter to our education, acculturation and hierarchical society.

I propose efforts to develop a people's research program, begun already in these pages, be continued, and that we all take responsibility to contribute what we can. The fate of the biosphere, or our particular bioregions, is too important to leave solely in the hands of scientists.

Humans, in my view, are created as healers. Our rightful role is to restore balance in our home bioregions. In past or other societies, those who excelled in restoring balance were honored as shamans. But shamanic power is in each of us to some extent. We need only empower ourselves to be open to our native abilities, then we can begin to develop them.

When I taught horticulture in Massachusetts prisons, inmates soon learned to produce uniform potting soils (two types) from materials that were far from uniform: composts, sands, rock powders, bone powders, etc. Composts were particularly variable. After some experience, almost every criminal on my crew could tell by "feel" if the potting soil was correct for its purpose. Intellectual knowledge about useful constituents and proper proportions played a part in mixing the soil, then psychic divination (though never identified as such) completed the job. The proof was in the plants — consistent results as required in a production greenhouse.

I suspect this ability to wholistically interact with soil and other components of our ecospheres isn't terribly much more common in criminals than in the rest of us. We have many abilities to interact with the forces of growth, balance, creation, and healing to enhance the abundance of life. We need involvement, opportunity to share experience with people more fully empowered than ourselves, and trust that the Creator made us to live constructively as part of the Earth Mother. With these, including our intellectual and analytical functions, we can readily know what a bag of rock dust should or should not be used for. Thank you, scientists, for your input. We'll bear it in mind when we evaluate our own conclusions.

Why does the author think that, in terms of bio-availability, the "altered ancient, freshwater marine bogs seem to be the best found so far." Is this the "gypsiferous shale" sold by the company he works with -- U.S. Soil of Salida, Colorado?

Since glacial till is generally far deeper than what can be observed walking on top, I'd suggest the author not rush to conclusions about the relationships between glaciation and "hard" vs. "soft" rocks.

Perhaps "the economics" of using U.S. Soil product seems to say 250 lbs. per acre is "optimum." Is this really optimum from the perspective of a sick and dying humanity increasingly destroying the life-support systems (including climate) of a largely degenerated, late-interglacial Biosphere? I certainly question it.

Where is "the usual" in "the usual research determinations for a product's viability..?" Which three U.S. rock dusts does he consider to have undergone "extensive testing"? How many lab tests does he think are necessary to accurately determine elements? Is he saying that before marketing or use, a rock/gravel dust must have at least analysis by atomic absorption, mass spectrometer, IR, Visible, UV, NMR, Gas Chromatography, and HPLC?

Where are the four basic stages described as "generally accepted"?

Tests with microorganisms in Stage 1 might help indicate what to expect of microbe proliferation in soil itself. In the lab at Austria's Lubke biodynamic farm, they counted increases of microorganisms after fertilization with just diabase rock dust and compost from about 50,000 per gram of soil to 3-4 billion per gram. No sign of "inhibition" there.

Greenhouse growth tests and the like, striving for identical starting soils and environment, sound sensible.

It isn't clear how insect and rock dust tests would be done. Is this intended to test changes in plant resistance to insect consumption on better mineralized soil? Or is rock dust being used on insects?

Perhaps the wording could be improved where the author says the Stage 1 screen is intended to determine "if there is activity on a living thing." As pointed out before, inorganic rock dust is subject to action or re-action of living organisms.

Since lungs are designed to work with pure air, it's of course wise to avoid breathing other substances, including rock dusts. Beyond this common sense, instinctual avoidance, I wonder if things like "acute toxicology tests and mutagenetic studies" are needed. Certainly if someone works in a gravel factory and isn't fully protected from inadvertent bodily absorption of dust we must be concerned, consider possible ill effects such as "silicosis" of lungs, and create healthy, pleasant conditions, as all ecologically constructive businesses and industries naturally have.

Under Stage 3, what's the method and relationship of "liquid culture" to what actually occurs in living soil?

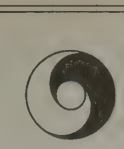
Would the author specify the "several products" - presumably "on the market" – where it appears pre-market testing consisted of a two-pot test? Perhaps the people he says did two-pot tests could respond to these questions, such as was one pot closer to a cool winter window? Was one pot richer in worm castings, etc. Is the "high" level of aluminum the author says is in feldspars significantly different than the average aluminum level in the Earth's crust? Perhaps *Encyclopedia Britannica* provides the answer.

Is the author "lumping" lignite coal in as a rock dust? Are companies selling it as rock dust? Has the author given a fair hearing to those who say some forms of coal dust are valuable to mineral-and carbon-stripped soils? I'm keeping an open mind, since I haven't read *The Carbon Connection* on "use of the right coal forms" by Leonard Ridzon and Charles Walters, Jr. (Acres USA Books, Box 9547, Kansas City, MO 64133). Anyone who understands Hamaker's Thesis knows where most new soil carbon should come from.

Does the author know of rock dust marketers adding filler or manufactured chemicals to their product? If so, I think it would be helpful to specify who is.

I don't think "the remineralization concept" will come under state or federal regulations. Gravel/mixed rock dust already does in some areas like the western U.S., where companies marketing it have it approved and registered as either "agricultural mineral" or "soil amendment." It would be good to read in ***RE*** what registration experiences people in the country and world are having. As far as "standardization" of materials and practices to remineralize the Earth, I'm not sure who is ecologically qualified to do this. I think we're quite able, however, to apply our hearts and minds to giving generously to the Earth in applying what we already know of natural processes, soil remineralization, and perhaps many of the "alternative modalities" he suggests may be helpful – to the degree they nourish and support the Natural Design, obviously. Thus quite able to set new "standards" of health, beauty, fertility, balance, etc!

The statement "Granted everyone would like to believe the simple solution to our beloved Earth's dilemma is to just spread around any ole rock dust," is, I think, nonsense. However, he may be right about the danger of us "being secretive, competitive or back stabbing". And right that simple solutions are often "just a thought away". Sometimes a little beyond thought.



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Directory

Gravel and Rock Dust Sources

FOR AGRICULTURE AND FORESTS

You can write for newly expanded Gravel Sources in 33 States and Canada
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For a list of gravel sources in your state, send a self addressed large manila envelope with 75-cent stamp to: David H. Miller Dept. of Biology, Kettering 103 Oberlin College Oberlin, OH 44074-1082.

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(800) 331-3659

See **Maine Seaweed,** Northeast Listing.

Pascalite, Inc.
P.O. Box 104
Worland, WY 82401.
Bentonite clay

Sacred Spring Marketing
P.O. Box 1226
Park City, UT 84060
(801) 649-0322
Clark's Formulas.

Super Blue Green algae comes from a remin. glacier fed lake; from Cell Tech Inc., Klamath Falls
1-800-321-1303.

Klamath Blue Green Inc. algae based in Mt. Shasta, CA. 1-800-327-1956.

KM mineral supplement based on plant sources, esp. high in potassium. Matol 1-800-237-7002.

NORTHEAST

Maine Seaweed Co.
P.O. Box 57
Steuben, ME 04680
(207) 564-2875
Sea vegetables and garden fertilizer.

Laurence Lynch Co.
Glenn Burbank
396 Gifford St.
Falmouth, MA 02540
(508) 548-1800
Native stone

The Notch
(Lane and Son)
Rte 116
Amherst, MA 01002
(413) 253-2075
Very fine traprock (3-400 mesh) basalt dust. Recommended for sugar maples. Used ideally in combination with glacial mix. Wear mask if applied dry.

Lane and Son
Attn: Gary
311 East Mt. Road
Westfield, MA
(413) 562-3694
Traprock and a silt and gravel mix.

Lane Construction Corp.
Jim Merold
P.O. Drawer C
Northfield, MA 01360
(413) 498-2956
Glacial till, 54% through 200 mesh.

Tilcon Mass., Inc.
Attn: Tim Kelly
72 Main St. P.O. Box 114
Acushnet, MA 02743

Tilcon-Arthur Whitcomb
W. Lebanon, NH 03431
(603) 352-0101
Greenstone-meta basalt– They have many sites in NH and VT. Call for info.

Henry Fleischman
36 Union St
Guilford, CT 06437
Contact person for the area.

Judy Roylance
Distributor Planters II
Trace Mineral Fertilizer
Rt. 1 Box 1398, Dogwood St.
Sag Harbor, NY 11963
(516) 725-1009

Kingston Traprock Co.
Dept. 1
Kingston, NJ 08528
Dia-King diabase rock powder. Write for info.

Flora-Stim
Strite's Warehouse
P.O. Box 128
Greencastle, PA 17225
(717) 597-3325

SOUTHEAST

Mr. Jim Glen
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570 Brevard Rd.
Asheville, NC 28806
Sells **Planters II.**

Davidson Mineral Properties
Gene Rice, Inside Sales
P.O. Box 468
Lithonia, GA 30058
(404) 482-7231
The granite quarry which formerly carried the product **Hybro-tite.** Ask for M10 sand.

Ground Force Intl.
Troy Konnick
1928 NE 154 St. #212
Miami, FL 33162
Rico Verde (custom blended Clodbuster)

Vulcan Materials Co.
We have not confirmed the quality of the sources listed by this company. These sites recommended by an engineer with the company.

Vulcan
Edmund Redd
P. O. Drawer 1590
Manassas, VA 22110
(703) 631-2060
Various rock sources.

Vulcan
Mickey R Love
P O Box 4195
Winston-Salem, NC 27105
(919) 767-4600

Vulcan
Hal C. Stokes
PO Drawer 8834
Greenville, SC 29604
(803) 277-2371

Vulcan
W. Max Stephens
P.O. Box 80730
Atlanta, GA 30366
(404) 458 4481

Vulcan
Alan C. Stanfield
P.O. Box 7324-A
Birmingham, AL 35253
(205) 877-3642

Vulcan
J. Lloyd Sentell
P.O. Box 7
Knoxville, TN 37901-6001
(615) 579-2903

MIDWEST

Brookside Farms Lab
for mineral analysis only
Director Mark Flock
308 S. Main St.
New Knoxville, OH 45871

Meridian Env. Group, Inc.
Rod Lertola
P.O. Box 628
Okemos, MI 48805-0638
(517) 349-9635
Bio-Plus – see full pg. ad

Michigan Aggregates
996 East Chicago Rd.
Jerome, MI 49249
(517) 688-4414

Mt. Ark Trading Co.
120 South East Ave.
Fayetteville, AR 72701
1-800-643-8909
Sell Planters II and ELX.

Vulcan
Dick Bade
1127 South Chicago Street
Joliet, IL 60436
(815) 726-5285

Vulcan, John T Douglas
500 West Plainfield Rd.
Countryside, IL 60525
(312) 482-7000

Vulcan, Daniel Roadruck
P. O. Box 5529
West Lafayette, IN 47906
(317) 743-2175

WEST

Bio-Rock
Industrial BioRemedies
P.O. Box 667
Paso Robles CA 93447-0667
Coming soon!

Clodbuster- Fertimax
Leland Taylor
701 Madison St N.E.
Alberquerque, NM 87110
(505) 298-1748

Earth Circle
Planters II
P.O. Box 6123
Littleton, CO 80121
(303) 850-0689
50# bags of Planters II.

EarthWealth
Walter Zmed
Livingston-Graham
16080 Arrow Hwy
Irwindale, CA 91706-0943
(818) 960-5471
A new product distributed in gardening centers, south CA.

Elemite
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P.O. Box 57796
Salt Lake City, UT 84121
(801) 278-5328

Grab "N" Grow
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Santa Rosa, CA 95407
(707) 575-7275

Mosaic Soil Co.
Howard Elmer
11965 Montana Ave. #5
Los Angeles, CA 90049-5038
(310) 820-6465
Supplier for different regions. Please inquire.

Nutri-Stone
Meganne Easling
P.O. Box 268
Ojai, CA 93024
(805) 646-6426

Peaceful Valley
Farm Supply
P.O. Box 2209
Grass Valley CA 95945
(916) 272-4769
Sell **Azomite, Soil-Min**

Peak Minerals- Azomite
101 N. Tejon, Suite 200
Colorado Springs, CO 80903
(719) 635-8000

U.S. Soil
Planters II and ELX
P.O. Box 926
Salida, CO 81201
(719) 539-3535
For larger shipments or to find a distributor in your area. Do not sell in bags.

Vulcan
Pat D. Kerry
P O Box 29310
San Antonio, TX 78229

NORTHWEST

Gaia Resources
Michael Dean
Box 215, Danville WA 99121
Distr. **Rado Rock JB2**

Roger and Gayle Kahane
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Cottage Grove OR 97424
(503) 942 DUST
Distr. **Rado Rock JB2**

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Additives Unlimited
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Fairbanks, AK 99706
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Alaskan glacial till.

Rado Rock JB2
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Gaia Resources
Michael Dean
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Grand Forks, BC
VOH 1HO, Canada
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Distrib. **Rado Rock JB2.**

AUSTRALIA

Australian Mineral
Fertilizer
Hendon Industrial Park
113 Tapleys Hill Rd.
Hendon 5014
Western Australia

Natural Mineral
Fertilizer
Norm Todkill
21 Blackwood Ave.
Morningside 4170
Brisbane NSW
tel 07 399-1230

Neo-Min
Organic Nature Products
261 Kingsway Rd.
Landsdale 6065 or
P.O. Box 1380
Wangara 6065
tel. 250-2059
FAX 343-3899

Pacific Mineral
Development Ltd.
Sam Catalano
P.O. Box 594
Innisfail North Queensland
4860 Australia
tel. 070-644118

EUROPE

AUSTRIA

Bioglück
A-3950 Wielands
tel 02852 2414

Diabaswerk
A-5760 Saalfelden
tel 06582 2373

Firma Diwoky
Frachtenbahnhof Gersthof
A-1180 Vienna
tel 472241

Firma Gleichenteil
Gleichentheilgasse
A-1230 Vienna
tel 672193, 672194

Kärnter Basalt
Kampach, St. Paul
Lavanthal

Konrad Planegger
Diabas Werk
A-9134 Launsdorf
tel 04213 2044

Sanvita
Hartsteinwerk Kitzbühel
Attn: Mr. Abermann
Postfach 44
A-6370 Kitzbühel
tel 05356-4333-0

Robert Schindele
Furnierwerk
Superbiomin
Kicking 18
A-3122 Gansbach

DENMARK

Greenworld
Export/Import
Werner Meier Jensen
St. Blichersgade 21. G.
DK – 8900 Randers
tel. 45-86-41-49-56

FRANCE

Societe de Carrieros
de St. Nabor
67530 Ottrot
St. Nabor, tel 88958114

GERMANY

Basalt
Vertriebgesellschaft mbH
and Co KG
Südniedersachsen
Bramburg,
D-3404 Adelebsen

Basaltwerk Wiesau/Opf.
250 Maclellan Bldg.
Triebendorf

Firma Ernst Otto Cohrs
Lava-Union
D-5485 Sinzig/Rhein
Kölner Str.22
tel. 02642-4010

Porphyrwerke Weinheim
Shriesheim AG
Postfach 1609
D06900 Weinheim

Schotterwerk
D-7613 Hausach/ Hechtsberg

SWITZERLAND

Bertrand Rime
1751 Middes
Fribourg
tel. 037 681335

Bioticino
V. Gautschin, V C Molo 1
6500 Bellinzona, Tessen
tel. 092 262 984

Firma Otto Gamma AG
Seestrasse 336
8038 Zurich
tel. 02 832765

Johann Wenger
Muller Poffetmuhle
1717 St. Ursen
Fribourg
tel. 037441173

Maurice Schillinger
Garten Center, Rte Suisse
1196 Glant, Vaud
tel. 022 642267

Wytor SA
1628 Vuadens, Fribourg
tel. 029 28280

Zimmerli
Mineralwerk AG
Hohlstrasse 500
8048 Zurich
tel. 01/432 10 40

ENGLAND

List of 80 quarries in U.K.
Redland Aggregates Ltd.
David Langley
Technical Manager
Bradgate House, Groby
Leics. LE6 0FA

College of Soil Research
Eileen Moore
5 Chase Side Place, Enfield
Middx. EN2 6QA
tel. 01 363 8615
Several kinds of rock dust and **Superbiomin** mineral powder for internal use.

Cumulus Organics
Two Mile Lane
Highham, Glos.
GL2 8DW
tel. 0452-305814
Ground volcanic dust.

Letters and Forum

International

SR in Denmark

I am setting up field parcels with different amounts of gravel dust on our farm this summer. In Denmark we are connected to a 3-year running official research project on organic farms, and I will make the gravel dust experiments in this connection.

Lars Sørensen
Odder, Denmark

Would Like To Export Grinder

The idea of formation of a trade association (SR #17) is a good idea. This would help the manufacturers to discuss their problems under one roof, and also the association can tender their demands with bureaucracy. By forming associations, it would be easy for the customers to locate the manufacturers and their products.

We should approach associations like the World Bank, which finances agricultural developments in Third World Countries, the World Health Organisation, to release more information on health advantages of natural fertilizers and hazards of chemical ones, food and ag organisations.

We have to stand firmly with logic in front of the chemical fertilizer manufacturers' lobby, as this lobby is very strong through its strong links with bureaucracy.

We are glad to inform you that we have a good source for a Pulverizer/Grinding Unit. If we can get the specifications, we can develop and export it, and we are sure it will be more economical than the others. We can develop any type of pulverizer according to the specifications of the individuals. Interested parties should contact us.

Basant Agarwal, Director
Essex Exports Pvt. Ltd.
150 Sarai Julena, Okhla Road
New Friends Colony, New Delhi 110025, India

Upjau Correction

RE #2 is great and I am circulating it among friends here. A printing mistake got into the letter of mine that you published. It concerns the cost of Upjau. It should be Rs. 1.500 and not Rs. 7.500. That's a big difference. In any case, even at Rs. 1.500 +1.500/ton for transport, it is something out of our scope.

I must say our soil here is not an easy one. It is a compacted, saline-alkaline black cotton soil (black clay). I don't know if elsewhere some people have some experience with such soils and SR. If you come across such info, please let me know.

Bernard, Revelation Farm
Auroville 605104, India

We have received your issue # 1 and would like to receive future issues.

J.E. David, Administrator
Data Centre for Natural Resources
World Wide Fund for Nature-India
Bangalore, India

Editor: The Centre publishes a journal, Environmental Resources Abstracts *giving up-to-date information on environment-related subjects.*

Tropical Agriculture Network

Could you please help me network with those who are working in *tropical agriculture* and recommend funding sources which could help to set up a bio-dynamic institution in India, or for this and other methods of organic farming? Also, I am trying to contact organizations and 'experts' and others that would be interested in funding, participating in and helping to develop the research/script for some films on these methods of agriculture.

Premilla Hobbs Dixit, 86 Sainik Farms
Khanpur: 110062, New Delhi, India

Having just read *Secrets of the Soil,* by where amongst many interesting concepts there is frequent reference to SR by either natural processes such as the spread of glacial sediments, or artificial processes such as spreading various types of rock dust from quarries, I would be very grateful if you could send me any details of this process. Is there any organisation or society in the UK dedicated to this process?

Dr. J.S. Conway
Senior lecturer in Soil Science
Royal Agricultural College
Gloucestershire, GL7 6JS, England

Editor: Please contact Eileen Moore, College of Soil Research, 5 Chase Side Place, Enfield, Middlesex, EN2 6QA.

Australian Research on Remineralization

Pacific Mineral Development has spent in excess of $500,000 in research. I personally have spent two years with CSIRO and 2 years with Queensland University doing research on mineral rock dust.

Trials in progress:

- Queensland University, 3-year field trial, evaluation of mineral rock dust.
- BSES, 5 field trials, on mineral rock dust effect on sugar cane.
- 2 trials of MRD on pasture dairy cattle.
- 2 trials of MRD on peanuts.
- 2 trials of MRD on maize
- 2 trials of MRD on potatoes
- 4 feed lot trials of MRD on cattle and pigs.

Trials completed:

- An evaluation of mineral rock dust as an ameliorant on low fertility soils, by Dr. Ross Gutteridge, B.Agr. Sc., M. Agr., SC. PhD., and Mr. Chris Searle, B.Agr. Sc., M Agr. SC.
- The effect of mineral rock dust on survival of Banana Scab Moth larvae by Dr. M.P. Zahicki, Senior lecturer from the Dept. of Entomology, Mr. T. Mi Rae, Senior Technician, and Mr. D. Margan, Technical Assistant.
- Particle Size Distribution, by Dr. Ian MacKinnon from the Electron Microscope Centre.

All the above work was performed by the University of Queensland.

S. Catalano
Pacific Mineral Development PTY, Ltd.
PO Box 594, Innisfail 4860
Queensland, Australia

Soil Data Base Computer Network in Australia

Congratulations on an excellent magazine. Main enquiry is to locate, with a view to purchasing/ordering one solar-operated rock grinder, i.e., dust-manufacturing equipment of the correct grade/screen size/s, so that one of us can get over there for a month or so to learn about the operation and maintenance, etc., of such machine/s.

Keep up the good work! I'd like to see an article about mixtures of microbes and rock dust to promote more biological action underground. Australia is leading the world in the belief that *soils* are not a 'renewable resource'; their

geological formation times are so long that widespread mining and/or loss of topsoil/s ensures that these vital, often deep resources are in fact non-renewable for most areas currently cropped and grazed in the western world.

I have for nine years pieced together a unique world data base of Rates of Soil Formation, which happens to be almost 50% US data. A preliminary analysis of all of that data shows that most soils on all continents are only renewable over 1000-year scale timespans, and that they are not 'renewable resources as defined by 11 out of 12 northern hemisphere textbooks, largely university texts.

I would like to learn more about SR and/or the campaign strategy that your group has commenced. This is almost certainly vital for our development in this country of a total re-education strategy to counter the obviously erroneous information still being propagandered in the schools... that our soils are renewable. Please consider the chance to swap info seriously. We will be on-line to Pegasus and other networks by September.

Joe A. Friend, World Campaign for Land & Soil
PO Box 350, Round Corner, NSW, Australia

Forestry Project on Prince Edward Island to Include SR

I am in the process of setting up an Ecological Forestry Demonstration Project on 100 acres of woodland in the southeast part of Prince Edward Island. This will include a wildlife garden and hardwood nursery, and managing 100 acres of woodland. Native trees and shrubs, wildlife garden plans, and transplanting information will be available free or at little cost to the public. The project will also demonstrate that forests can provide many benefits without having to resort to clearcuts and chemicals.

I am in the process of raising money for the Ecological Forestry Demonstraton Project I have set up, so I spend money as it comes in. We got a good start on the nursery this year, planting over 10,000 tree and shrub seeds of about 40 species.

I am still looking for local sources of dust and will contact people in Canada from your Network section. Once I find a source, I will contact you on amounts to use. Any information you can send specifically on forests would be greatly appreciated. I also hope to get some of the organic farmers and gardeners here interested in doing some trials, and will show them the newsletters.

On page 20 of issue #2, Dan Hemenway writes about "accumulator" species. Is there a list of such plants that grow in the northeast? Where could I find out more about these? In parts of Europe they are using beech in plantations to accumulate calcium, but I have had a hard time finding more information on the subject.

Gary Schenider, Coordinator
Environmental Coalition of P.E.I.
RR#6, Cardigan, P.E.I.
C0A 1G0 Canada

Editor: For a response from Dan Hemenway, please see the article Accumulator Species *on page 53.*

More Canadian Research on SR

Please send me information about your project and magazine. I recently saw it noted in *The Stockman Grass Farmer*. I would like to use it as reference material in my courses.

Ralph C. Martin, Ph.D, Assistant Professor
Nova Scotia Agricultural College
Truro, Nova Scotia, Canada

Dr. Ralph Martin (Plant Science, NSAC) and I are both friends and colleagues at the same institution. I was floored when he showed me Issue #1 of ***Remineralize the Earth,*** since I had never heard of your organization or SR Newsletter prior to his showing me the first issue.

I have been using rock mineral fertilizers (notably rock P and gypsum) in my research and in general farm use for the past few years. Last winter we conducted a survey, as part of a research contract, of potential users of rock minerals. We also evaluated the solubilities of a number of rock minerals over a period of about six weeks.

Phil Warman, Ph.D., P. Ag.
Coastal BioAgresearch Ltd.
RR#5, Truro. Nova Scotia, B2N 5B3 Canada

Many thanks for the copy of ***Remineralize the Earth*** you sent me earlier in the year. I found it extremely interesting, informative and encouraging, and have even started my own pot tests with radishes and 'home ground' Pyrenees (mountains in south of France) basaltic rock dust. Though I haven't yet got hold of rock dust in bulk, it does exist in Europe (as you know) and I'm getting nearer to sources in France that I've recently heard of. When I manage to acquire some of this I'll try it on my garden.

I intend, and have wanted to subscribe to ***RE,*** but recently have found 'processing fees' for foreign cheques so high in the cases of other items ordered from America, that I would like to ask you in advance what are the charges beyond the face value of my cheque or bank draft in dollars and also what would be he cheapest way to pay for my subscription. I'm trying to arrange a chequing account in America.

In the meantime, I've written to Betsan Coats in Australia to see how I can get in on the "Snowballing" project, but haven't heard from her/them yet.

I also did an exploratory tour around the Pyrenees in July/August to check out people doing Permaculture and other organic projects; also to see about the availability and awareness of rock dust... I hasten to say no one I met was using rock dust of any sort, and only a few had heard of the whole concept. Apparently it is available in that area though, but I still have to make some more enquiries next time I go down there. If it's interesting to you, I'll let you know what I find after my next trip to the area.

Well, keep up the good work, and though we all know the chemical companies and other multi-nationals are working overtime to further their shortsighted interests, let's all try to keep a positive outlook on the difficult work of trying to do the nearly impossible: i.e., changing the future to a sustainable and humanely liveable one.

Rupert Drew
La Maliyn, Murri, 24190 France

Editor: Bank check fees are simply too expensive. I prefer a U.S. Dollar Postal Money Order. This is much less expensive for all.

U.S.A.

LISA and The Paradigm Effect Slowing Real Progress in Remineralization

It is obvious from the contents of your outstanding publication that farmers and gardeners in many areas lack access to economical sources of the materials for complete soil remineralization. And as Julius von Liebig wrote more than a century ago, "Yields are limited by the essential in shortest supply."

Similarly, foods, feeds and forages grown on soils lacking even one essential plant food cannot deliver maximum health to those consuming such grown on those deficient soils.

The current USDA-aroused mania "LISA" (Low Input,

Sustainable Agriculture) compounds the health-destroying fertilizing practices of the past (NPK and lime) by circulating educational materials which ignore plant, animal and human health needs for minerals. In fact, five pounds of "progress reports" mentioned only five of the sixteen elements recognized as necessary for plant growth– N,P, K, C(arbon) and Magnesium! (The "Low Input" part of LISA has been dropped – the entire diversive program has become "Sustainable Agriculture".) That five pounds of "progress reports" contained absolutely nothing which hasn't been practiced by U.S. farmers.

Back to the problem of "fixing" the maximum of carbon dioxide: How much more carbon dioxide would be fixed by Glenn Everett's 1991 160–bushel corn crop than those crops by his conventionally fertilizing Gnadenhutten, Ohio drought disaster aid receiving neighbors? The complete and scientific remineralization of farm lands with economically affordable and readily available non-synthetic materials has been slowly expanding throughout the past 25 years. The slowness of expansion is largely the result of the psychological condition recognized as "The Paradigm Effect". Scientists are more seriously afflicted with that mental set than are lay people. Certainly John Hamaker's, and your efforts to remineralize the soils of the Earth have been seriously retarded by those scientists who simply cannot "see" the proof of changes for the better.

The Paradigm Effect is so all-embracing that the only scientific event I can think of which was not greeted first by ridicule, then outright disbelief, and finally acceptance, was the Hiroshima Atomic Blast. I'm old enough to remember, "Get a horse!" whenever an automobile stalled or got stuck in mud or snow. Here's my sub.; keep up the good work.

Leland B. Taylor, Publisher
Biological Farming News, Agronics Incorporated
701 Madison St. N.E., Albuquerque, NM 87110

Algae, Key To Reduce CO_2

I am moved to act upon all the suggestions advocated by your publication. I'm currently making headway with an educational project to engage Scout Troops in backpacking rock dust into disheartened forests. Also have been promoting the use of Elemite (an exceptionally potent dust sporting 70-plus trace elements and minerals occurring in a naturally colloidalized form, available in huge quantities here in Utah), in hopes that local agriculture can be revolutionized.

All research data available from University and Government studies which you print is much in demand, as it acts to further convince the mainstream agricultural community of rock dusting, in conjunction with other organic, sustainable methods, as being a viable and needful practice.

What I'd like to bring to the attention of all your readers is the importance of propagating algae for the sake of balancing out the CO_2 levels with oxygen. The scale indicates that one cubic foot of live algae produces as much oxygen as 150 full-grown trees. To green an area the size of Colorado would balance the existing problem. To do it with trees would require five times the size of the United States.

I've been collecting algae specimens from nearby rivers and lakes in bottles I've gathered from recycling bins. I take an algae-covered rock, put it in the bottle with its native water, then add a couple tablespoons of Elemite. I'm keeping the bottles in my greenhouse and along my windowsills for warmth and sunlight, and finding that they're thriving. Algae breed best when supplied with a wide array of minerals, in water kept between 60 and 80 degrees F and exposed to sun or full-spectrum light for at least 5 hours daily, though 6 to 8 is preferable.

If a couple million people engaged in algae propagation, a serious dent could be made in the atmospheric CO_2 levels. This is not to discourage the grand effort of remineralizing forest and agricultural lands, and changing our ways as consumers to ways which return and multiply the abundance which has been freely shared with us by our glorious Mother Earth.

Kimberlee Jaslowski
5107 Emigration Canyon,
Salt Lake City, UT 84108
801-583-9902 or 582-9368

Editor: See Famine or Feast *on page 28.*

Synergy Seeds

It seems likely that you have heard about my work through Don Weaver, since he was especially fond of the diverse collection of melons and other crops which I grew and provided for Bay Area markets during the 8 years I owned and operated Arbor Vitae Farm in Capay Valley, Yolo County, CA. In fact, he may have helped deseed some of the same Heirloom melon seeds offered in the enclosed list. I did a great deal of experimentation with rock dust over the years, thanks in part to encouragement from Mark Chass as well.

This year I moved to this spectacular setting on an organic farm in the northwest corner of Calif. for a full season growout of many of my favorites, new trials and relaxing wildcrafting forays throughout the North Coast Range. It's a busy time right now with all the harvest, drying, cleaning, sorting and listing needing to get done by year's end.

I have done a lot of work along the lines of Dr. Alan Kapuler of Peace Seeds, thanks to his very astute guidance and friendship, since 1987.

George Stevens, Synergy Seeds
Box 323, Orleans, CA 95556

Editor: See Synergy Seeds *article on page 27.*

We received your Winter 1991 issue, and have read and reread it with great admiration for the work that is being done. We are looking for a "formula for fertility and sustainability". This would be the proper innoculation and population of micro-organisms that are non-pathogenic, to therefore bioremediate the pathogens (mutated microbes) to work with nature rather than destroy it, chelate the heavy metals into essential nutrients with the implementation of soil remineralization, microbial products, disease-free humus and worms. We believe that with a combination of all these factors we can build a better and healthier tomorrow, starting with the soil.

We currently market microbial and related products. Benefits of products we promote: instant odor control; digestion of difficult compounds which are toxic to naturally occurring bacteria or existing sewage bacteria; provide rapid breakdown of difficult detergents, fats, oils, tissue, hydrocarbons, etc.; they are certified salmonella-free, noncorrosive, non-pathogenic, safe to handle, ship and store.

Steve Johnson, President, Industrial BioRemedies
2453 Captains Walk, Bradley, CA 93426

Since we last spoke I attended the Student Environment Action Coalition national conference in Boulder. It was an exciting and inspiring event. I had an opportunity to pass the newsletter on to about a dozen influential figures in various agriculture fields. Most of them were ag professors at universities, who were excited to begin testing and possibly work it into their program. I told them it was important to send any data they collect to you so it may be published.

I recently learned about the upcoming Earth Summit in Brazil. I am considering attending that in June. I feel that

it is important that remineralization be represented, and if I do end up attending, I would like to help to do that.

Peter Waskiewicz
General Delivery, Kilheaua, HI 96754

*Editor: Peter is currently working with George Hadley (see **RE** #2, page 20) and others on a proposal for a sustainable farming research center on 25 acres in Kilauea on the island of Kauai.*

We have been using basalt crusher dust on our 8-acre organic farm for several years. Initially we ran some test plots on garden herbs, and the results were convincing. We have been using 45 tons a year ever since.

The local quarry, Green Rock Quarry, makes railroad ballast out of Lovejoy basalt talus from a huge lava flow called Table Mountain. The crusher dust is 3/8 minus – pretty coarse material. But it's about 40% fine, and cheap at $4.15 a ton.

Some individuals and groups have been trying to shut down the quarry. I found myself, an organic farmer and lifelong environmentalist, defending the rock quarry in a county planning commission hearing, speaking against the Sierra Club. Who wudda thunk....?

I told the planning commission it was a valuable soil amendment, available to local farmers. I got into some detail about how rock dust works to regenerate depleted soil. The planning commission hearing was covered in depth by the local media. Even though they misquoted me and misspelled my name, I got phone calls and inquiries from area farmers, asking about rock dust. I tell them that it is simply a mineral fertilizer. Just get a little, and test it. The results will convince you, sez I.

Now the quarry is sifting out the chips and selling 1/8 minus to local folks. Most farmers here in Northern California are not able to embrace the concept of organic farming, much less the Hamaker doomsday scenario, but they do recognize results on the farm. It ain't much, but it's a start.

My question: Do you have any mineral analyses of basalt dust? I don't care what is in it, because I know it increases plant health. We use rock dust and organic material on our soil, and leave it to nature to sort it out. But these "modern" ag school farmers, weaned on N-P-K, gotta have some numbers. Can you help me out?

Keep up the good work. Rock dust works and can save the planet. If we can just spread the word.....

Wade Hough, Gaea's Garden
Palermo, CA

Editor: This is an analysis of Lane Quarry Basalt Dust, Amherst, MA. This is Westfield trap rock, or Gabbroitic diabase, composed primarily of kaolized plagioclase and chloritized augite.

Lane Quarry Traprock

Mineral	Percentage
SiO2	49.2
AlO3	13.2
Fe2O3	17.0
CaO	7.8
MgO	6.3
K2O	4.3
TiO2	0.3
MnO2	0.2

Enthusiastic About Azomite

So thrilled to hear you mention Azomite. We used it with great success many years ago gardening on two acres in Southern Arizona. Have tried to find out where to get it, with no luck until we contacted you.

However, now that we are doing indoor gardening, it may be another matter. We are in the process of soil testing to see what we have and what we lack. Depending on the results, we may have to treat our soil differently. We are using Super Soil, and so far it looks very good. Before too long we hope to build another greenhouse so we can garden without weather worries. We had two in the past. They provided us with lush crops all year round.

The Supersoil bag says it's an exclusive blend of the finest natural ingredients nature has to offer, including fir bark, redwood, Canadian sphagnum peat moss and pure sand. The pH range is from 5.5 to 6.5. If you are interested you should be able to get it at any nursery.

We are having a ball raising a good variety of sprouts. This is an excellent addition to the program outlined in our book, *Live Foods, Nature's Perfect System of Human Nutrition, 192 Recipes*, by George and Doris Fathman. We didn't know about sprouting when we first published our book in 1967... A total of nearly 60,000 have gone world-wide. Most health food stores carry it; if not, they can get it for you.

As you requested, we will keep you informed of our progress with reports and pictures.

George & Doris Fathman
Life Research Foundation, Yarnell, AZ

More From Readers of *Secrets of the Soil*

I am writing you to desperately obtain more information on SR. I first came into contact with this subject while reading the book, *Secrets of the Soil*. I read with interest of the research and experiences of John Hamaker, of Robert Schindele and rock dust applied to his Austrian forests (and taken internally himself), and Rollin Anderson and his Azomite.

Right now I'm in the midst of a 5-year learning experience of organic, non-chemically dependent gardening which I hope to come out of with enough experience and knowledge to move my operations to New Mexico, and on a much larger scale (several acres as opposed to a small backyard garden). I have been gardening all my life, but it was just last year that I went totally organic, and I had fairly good results. Though I was not using chemicals, I didn't have quite a lot of knowledge or experience with organic methods. Now I have quite a lot of knowledge, and hope to put it into practice this year. I was intrigued with the whole remineralization idea, since so much attention in organic methods is focused on compost and humus and microorganisms. While I understand how vital such aspects are, I can also appreciate the equally important mineral content in natural forms and proportions. That's why glacial valleys are so fertile. I am also very excited because of the practicality of SR, a very simple and economical solution to agricultural fertility problems. But I need to know so very much more. I have lots of questions! I hope the newsletter can answer them all.

Robert Tower
1778 Great Highway, San Francisco, CA 94112

Broadening Agricultural Literacy

I obtained your name and organization from the excellent book, *Secrets of the Soil*. The book gave me more grist for the secret mill of alternative education that I am building out here in the west.

I am just finishing up a special graduate degree in writing development at Sonoma State University. My vision is a

community-based literacy and agroecology education program that will facilitate, among adult learners, the development of vital communication skills as well as a practicing acquaintanceship with the soil. My reason for combining the two is simple: there can be no true liberation of the spirit without direct ability to sustain oneself by growing one's own food. My urban counterparts at the university scoff at this, dismissing me as a sentimental farm boy who hankers for the simplistic life of the farm. Well, I do indeed hanker for a return to cultural values rooted in a deep appreciation for the soil which is the sustainer of us all.

So, I am writing to you to see if you have any recommendations or referrals related to the broad area of agricultural literacy. I know that your organization does work on remineralizing the soil, and I would like to have some background information on that. I will use the information in two ways: to possibly integrate into my writing development curriculum at the university (I teach an experimental adult literacy course which requires students to go out into the 'real world' and investigate a particular discourse community. I encourage them to explore ecological or agricultural entities because these will play major roles in the re-shaping of our country in the coming years). Also, I am a freelance writer who writes about ecological subjects, and I am currently working on a major essay on organizations around the country that are trying to re-educate the public into good stewardship practices. I agree with Wendell Berry when he says there is little use in waving the banner of global ecological issues when the real work of restoring our planet begins in the back yard – or the back forty as the case may be. So, I would appreciate any advice you may give relevant to the areas outlined above.

Terril L. Shorb
P.O. Box 3256, Santa Rosa, CA 95402

I recently read *Secrets of the Soil.* The arguments for SR appear to be quite compelling. We aren't farmers, but in our garden have had good preliminary results using local rock dust and Azomite. The size and quality of our lettuce is quite remarkable. Everyone is amazed.

Bob Knox-Quinn
Eugene, OR

I may be interested in receiving the journal regularly, and perhaps contributing information. I am researching the use of rock powders and have had *very dramatic* results.

Wayne Bjordahl
Dell Rapids, SD

Flowers and Rock Dust

I am breeding begonias. I have several that no one has yet been able to flower in "captivity". I believe that adding rock dust may increase my odds for success. One of them is from the Philippines. If I can duplicate the natural soil, I think I can get it to flower. If you can direct me to someone or to a publication that might help, I'd be most appreciative.

Stephen Coppins
30 Mygatt Street, Binghamton, NY 13905

I was reading [your second issue] yesterday and saw your article on George Hadley (see ***RE*** *# 2*, page 20). By no coincidence whatsoever, I just happen to be leaving for Kauai on Thursday. I would very much like to see George, if at all possible, and look over his farm.

... my intentions for the future are very much linked to SR and organic gardening. I'm also enclosing a picture of my home which I landscaped last year. I double dug the majority of areas and used huge quantities of sphagnum peat moss, fine and coarsely ground redwood pine park, leaf mould and also Milorganite – an activated sewage sludge. The result was amazing. A lady from *Sunset* magazine came out in May and could hardly believe the prolific growth that had occurred in a single year. I took the photos of the back garden about three months ago. The grapevine and wisteria now cover the entire semi-circular patio cover and the flower boxes on top of the fencing are a mass of colour. I wish I had known about SR then, however, it is certainly not too late to start now. My intentions are to create a botanic garden-cum-metaphysical centre. The gardens would be entirely organic in nature, using and making available products such as yours, that would enable people to learn about and create their own natural and entirely chemical- free gardens.

Events have been occurring over the last couple of months that seem very encouraging as regards bringing the centre into fruition. In the meantime I am anxious to learn anything I can from you or anyone else connected to the cause.

Nick Sutcliffe
13845 Shady Knoll Lane, Chino Hills, CA 91709

I own a woodlot in Vermont and am very anxious to begin a program involving rock dust as a fertilizer. The whole concept makes so much sense. In March I plan to roam through the southwest in hopes of picking up a rock crusher. As you indicated in your magazine, the *California Mining Journal* is a good source of both new and used equipment. I look forward to your next edition.

John L. Hyde
North Woodstock, NH

COLUMBUS QUINCENTENNIAL

The Three Sisters

Native Seeds & Indigenous Agriculture

"...we paid immense attention to American Indian crops, or at least some of them, but almost no attention at all to American Indian farming. Books, movies, radio and TV give images in abundance of the Indian fighting, hunting and in ceremonies, but few of the Indian farming or gardening. ...another instance of our disposition to value substance above form – in fact, to destroy form for the sake of substance. We destroy farms for the sake of crops, just as we destroy forests for the sake of timber.

Nabhan put it: 'Modern agriculture let temporary cheap petrochemicals substitute for natural intelligence and stored genetic and ecological information in self adjusting biological communi-ties.' And for human intelligence stored in human communities."

– Wendell Berry

In searching for methods and a philosophy for sustainable, ecological farming and diet, we are wise to look under our feet at agriculture native to North American soil. Traditional native agriculture is based on The Three Sisters: corn, beans & squash. They weren't just food, but a complete cultural complex, including legends, stories, social order, planting & harvest methods, ceremonies, songs, dolls, etc. Growing these three crops was the calendar for each village.

At Akwesasne on the St. Lawrence River, Mohawk Steve McComber visits elder gardeners who still grow old Iroquois seeds. In 1991, Steve's collection of native genetic treasures included 12 varieties of corn, 12 Indian heirloom beans and over 40 strains of Iroquois squashes. Last fall he found a few more varieties.

Steve will give a workshop on Native Seeds and the Three Sisters at the NOFA Summer Conference Aug. 14-16 at, Hampshire College, Amherst, MA.

Steve needs help growing out so many old varieties. Any organic gardener with space for one or a few of these native heirloom Three Sisters strains should write:

Steve McComber
Mohawk Nation, Box 314
Rooseveltown, NY 13683

The World is Catching Up

by Dan Hemenway

***RE** readers may recall that a while back in **Soil Remineralization, (SR #15-16)** I promoted the idea of using banana fiber and sugar cane waste to produce paper. So when a rain forest is cleared for banana plantations at least the by-product of banana growing can substitute for cutting further trees. Likewise for cane. Now we read the following report in the Feb., 1991, issue of* Pacific World. *(US $22 surface mail or $29 air mail per year from Pacific Institute of Resource Management, POB 10-123, The Terrace, Wellington, New Zealand.)*

Paper from Bananas

A new way of making paper from sugar-cane waste and banana-tree stems has been found by researchers in Japan. The process is free of noxious chemicals associated with conventional paper-making. It has enormous income potential for tropical farmers who currently burn off the raw material as waste. The low cost of the process makes small-scale production feasible. Source: "Soft Technology" 34, 1990.

Unfortunately, the Pacific World item does not say where in Japan to get technical details (which might be useful only if you happen to read Japanese). However, when in the Philippines, I was told that the University of Los Banos (appropriately, at Los Banos) has a research library on papermaking. This could be another starting point for information on a suitable process. I suspect that most good inventions are discovered any number of times before someone recognizes their worth.

Banana fiber will produce paper of the highest quality. I'd guess that a process for using fiber from non-woody plants could adapt to a variety of other feedstocks such as cattails and related rushes, which we proposed in previous issues as paper feedstock. They would be grown as part of a wastewater treatment facility, as cattail marshes are very effective in cleansing water that passes through them. Water hyacinth might also work with the Japanese process. In the case of water hyacinth, the paper factory would need to be located close to the source because the high moisture content of water hyacinth makes it too heavy to transport economically. Locating plants near rivers and lakes clogged with water hyacinth requires careful design to avoid further pollution of the water. (The hyacinth is present in these places because it is fertilized to tremendous rates of growth by organic pollution and chemical fertilizer run-off.)

If the Japanese process can be adapted to utilize different types of suitable plant materials, then it can be operated to absorb seasonal wastes.

Now we need processes that utilize the organic "waste" from paper-making--e.g. lignon, starch, etc. These can be returned to the soil or utilized in lieu of other crops for products such as wallpaper paste, polymer feedstock, etc.

Designing a Sustainable Homestead
in West Olive, Michigan, August 21-30, 1992
in Orange Park, Florida, October 30,-November 8, 1992
3 Week Permaculture Design Course
near Jacksonville, Florida, March 2-20, 1992

Students will be immersed in the process of designing a 10 acre homestead site in the are. Topics: principles of Permaculture design, water supply and conservation, solar housing design, poultry integration w/ orchard and greenhouse, aquaculture, tree crops, organic gardening and related themes.

◆ Write for a schedule of design courses in U.S., Canada, worldwide or to sponsor a design course in your region: Elfin Permaculture, 7781 Lenox Ave., Jacksonville FL 32221 USA.

Industrial BioRemedies' microbial products provide solutions for basic human sanitation and environmental needs through Bioremediation. These products are non-toxic, safe and effective. The company's mission is to promote, market, and distribute microbial and related products, and organizations which not only do not ever degrade the environment, but actually enhance it. Industrial BioRemedies also exclusively distributes **MajicDrain, "The Magically see-through catch all."**

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Quantity Discounts Available

A grapevine for subscribers– to network and communicate with each other about SR

The Network

Subscribers are invited to join the listing. Please contact us so we can include you. For a complete and current list add these to the list in ***RE #1-2.*** SR = soil remineralization.

Basant Agarwal, Director
Essex Imports Pvt. Ltd.
150, Sarai Julena (2nd floor)
Okhla Road, New Friends Colony
New Delhi 110025 India
FAX: 011-6447032
Own a mine containing natural minerals. Would like to export Natural Fertilizer *Upjau* anywhere in the world. Quality assured.

Giselle Allison
201 Edgewood
LaPorte, TX 77571
(713) 471-8278
I am an herbalist/gardener, very interested in organics.

Rodney Barnes
25412 Browca St.
Hemet, CA 92544
(714) 927-8069
Lecturer, consultant, and distributor for Rico Verde and Clodbuster.

Bernard
Bharat Nivas Post
Auroville 605101, India
Developing ecological farming systems for the tropics.

Jim Berry
Center for Reflection on the Second Law
8420 Camelia Drive
Raleigh, NC 27613
(919) 847-5819
Monthly newsletter and annual conferences on the human fit in creation.

David Bird
66 Fresh Pond Lane
Cambridge, MA 02138
(617) 864-2521
Economic consultant

Natalie Balhut
9302 Miccosukee Road
Tallahassee, FL 3208-9605
(904) 656-6097
Very interested in trying rock dust and finding best type and source to get. We son't seem to have good rocks in Florida, or do we?

Luc Bodin and Anna Bond
RR3, Box 145A
Athens, VT 05143
(802) 869-2942
Small farm growing heirloom grains, beans, vegetables on remineralized soil.

James and Holly Burris
P.O. Box 105
Franconia, NH 03580
(603) 823-8434

Jim Carpenter, Cell Tech
1300 Main Street
Klamath Falls, OR 97601
(503) 882-5406
Supplier of Super Blue Green Algae products. Experimenting with rock dust.

Melbourne R. Carriker
23 Hoornkill Avenue
Lewes, DE 19958
(302) 645-8768
Small group in So. Delaware exchanging info after using rock dust from a quartz quarry. Richard Pack obtaining the rock dust and is promoting its use and sale.

Sam Catalano
Peak Mineral Development Ltd.
PO Box 594
Innisfail 22207
N. Queensland, Australia
tel. 070-644118
Source of rock dust, have done extensive research, available for consultation. See *Letters* section for details.

Coastal BioAgresearch, Ltd.
Dr. Phil Warman, Agron., Soil Scientist
RR #5 (Lower Onslow)
Truro, B2N 5B3, Nova Scotia, Canada
We (CBA) have a research farm where we evaluate alternative systems, exp. with rock fertilizers, organic amendments, etc.

Cyclone Crushers
Lee Poindexter
1717 Centennial Blvd., Suite #9
Springfield, OR 97477
503-744-0780

Phil Dalley
C.S. Dalley and Sons
RSD Myall, via Kerang
Victoria 3579, Australia
054-451285

Premilla Hobbs Dixit
86 SainikFarms
Khanpur: 110062, New Delhi, India
Planning stage of film on sustainable ag. Networking SR in India.

Howard Elmer
Mosaic Soil Co.
11965 Montana Ave. #5
Los Angeles, CA 90049
(310) 820-6465
Supplier of rock dust.

Rodney L. Edington
333 West State St., 120
Trenton, NJ 08618
(609) 394-1787

David M. Ellis, President
Renewable Forestry Service Inc.
PO Box 530
Barnesville, GA 30204
(404) 358-3886
We reforest private and gov. lands.

Tom Ellis
1812 26th Ave. S.W., Apt.#21
Calgary, Alberta T2T 1E1, Canada

Richard Erganian
The Vineyard
50 West Shaw Ave.
Fresno, CA 93704
(209) 222-0182
Organic gardening: vegetables, fruit trees, ornamental landscape trees, shrubs and vines.

Bertil Eriksson
Elgboda
S-74190 Knivsta, Sweden
018/342928

David G. Estes
PO Box 8571
Emeryville, CA 94662-8571
415-655-6087
High quality wheat grass, demonstration project of rock dust effectiveness. Raw vegetable juices.

Oli Eyvindson
Box 1605
Portage la Prairie, Man.
R1N 3P1, Canada
Retired farmer interested in finding rock dust close to Manitoba.

Christine Foster
Fata Morgana, Inc.
46 Chine Drive
Scarborough, Ontario, M1M 2K7
(416) 264-4081

Jon Frey
Frey Vineyards, Ltd.
1400 Tomki Road
Redwood Valley, CA 95470
(707) 485-5177
Organic grapes and wine production. Building solar electric rock crusher.

Joe A. Friend
World Campaign for Land and Soil
PO Box 350, Round Corner
N.S.W. 2158, Australia

Todd Garrison
Rte. 4, Box 667
Spring City, TN 37381
Backyard gardener/orchardist; natural hygienist.

Norma Gimlin
506 Sebastabol Street
Claremont, CA 91711

(714) 621-3627
Sales Dir. with Softron Intl. marketing environ. products for water conservation, reducing water and air pollution. Working to combine *Hydrosoil* with SR.

Bro. Alois Goldberger
Regional House Ubbog
Bangued, Abra 2800, Phillipines
Working with tribal communities in the hinterlands, where we can not get machinery to crush stones for SR. Is there any other way for such remote areas to remineralize the soil?

Grailville
Audrey Sorrento, Prog. Dir.
932 O'Bannonville Road
Loveland, OH 45140-9705
(513) 683-2340
Conference center on 300 acres of farmland. Residential Semester for women, spring "New Women, New Earth". Ecology and Env., Feminism, Spirituality, American culture.

Nancy Harmon
P.O. Box 1
Ahwahnee, CÅ 93601
(209) 683-3413
Small farm holder, Yosemite region, using full scale SR (my neighbors can be the control plots). Purchasing dust in "coop" style w/ other interested parties in area and setting up demos for nurseries and others. This is good stuff!

Dan Hemenway
Elfin Permaculture
7781 Lenox Avenue
Jacksonville, FL 32221
Write for info on permaculture designs, workshops and publications.

Industrial BioRemedies
Steve and Peggy Johnson
2453 Captains Walk
Bradley CA 93426
See ad and *Letters* this issue.

Bill and Doris Isely
80 Walnut Creek Road
Franklin, NC 28734
(704) 369-7590
Organic gardening and orchard w/ SR.

Tina James
12812 Bridlepath Road
Reisterstown, MD 21136
(301)252-3333
Organic gardening teacher, writer and past host of local public TV series. Currently conducting rock dust experiment with granite and basalt donated by Genstar.

Ralph Jarnagin
Rte 6, Box 167
Crossville, TN 38555
Retired gardener w/ 16 acres timber, many trees dying due to growing on sandstone and little soil. Suggestions?

Kimberlee Jaslowski
5107 Emigration Canyon
Salt Lake City, UT 84108
(801) 583-9902 or 582-9368
Experimenting with algae propogation. Distributor of **Elemite.**

Berjig Javian
17 Addison St.
Arlington, MA 02174
(617) 643-4522
1-800-325-4522
Healed seizures from auto accident, renewed mental clarity, energy, relief from allergies w/ wild algae from Oregon. Thank you, Mother Earth; self healing and accelerated recovery here if you want it.

Birgit Johanson
90 Main St.
Jaffrey NH 0342

Roger and Gayle Kahane
72650 London Rd.
Cottage Grove, OR 97424
(503) 942- DUST (942-3878)
"Gourmet rock dust" in the So. Willamette Valley. Specializing in Rado Rock. We can deliver within a reasonable distance.

Bernard Keating, MVB, MRCVS
"Duhallow", Aughrim
County Wicklow, Ireland
353-402-36144
Veterinarian researching SR for gardening and animal health supplement.

Jean A. Kelton
RR3, Box 2994
Honesdale, PA 18431
(717) 224-6227
I am retired - have 13 1/2 acres in the Pocono Mts. and have many trees and blueberry bushes.

Lee Klinger, PhD
National Center for Atmospheric Research
PO Box 3000
Boulder, CO 80307
(303) 497-1474
Looking for collaboration and support for large-scale soil mineralization experiment.

Roger La Chapelle
9090 Laurel Cyn. Blvd.
Sun Valley, CA 91352
(818) 768-6722

Christopher T. Mahoney
Michael G. Nicholson
3450 W. Central Ave., Suite 328
Toledo, OH 43606
800-666-8476
Environmental technology for the beneficial utilization of sewage sludge - N-Viro Systems, Ltd. C. T. Mahoney, Nat. Sales Director; M.G. Nicholson, National Product Mgr. and Marketing Rep.

Robert E. Maki
814 Revere Rd.
Glenview IL 60025
(708) 724 8238

Diane Martin
Ecological Agricultural Projects
PO Box 191, Macdonald College
Ste. Anne de Bellevue
QC H9X 1CO, Canada
EAP is a non-profit, independent resource centre. Our aim is to promote the dev. of sustainable food production systems based on ecological principles. We provide info and advice to students, the general public, gov., other org. and industry, in Canada and world. Our library is comprised of approx. 1500 books, 400 vertical files (containing articles, reports, bibliographies and information on other similar groups around the world) and over 70 journals.

Margaret and Scott Martin
Solarworks! Hawaii
P.O. Box 103
Naalehu, HI 96772
808-929-9637
Your ultimate Hawaiian Big Island Connection w/ a retail store called Solarworks. Margaret sells real estate, specializing in Big Island properties. We're also into raw foods, permaculture and polyfidelity.

Peter McCallum
2615 North 4th, #609
Coeur d'Alene, ID 83814

Minnehaha Ag Service
102 East 7th Street
Dell Rapids, SD k 57022
(605) 428-3657
Consulting and vending, ten years experience totally dedicated to natural systems of fertility and crop production.

Derek Mitchell
Box 9533
Saskatoon, Sask. S7K andG1, Canada
Interested in latest research on SR and any info on production (equipment and techniques) and marketing of rock dust.

Charles B. Morenus
9238 Three Oaks Drive
Silver Spring, MD 20901
(301) 951-5505 W
(301) 585-6857 H
Soon moving to Fairfield, Iowa. Interested in distributing rock dust in the Midwest. MBD with 12 years sales and marketing background. Presently own computer software company.

Jeremy R. Nash
Jarramarumba
Bostobrick Via Dorrigo
N.S.W. 2453, Australia
(066) 57 5192
President: Australian Kiwifruit Growers Ass'n. Kiwifruit orchardist and beef farmer with land partly covered in semi-tropical rainforest and eucalyptus forest, partly cleared for

farming, and the whole leached by high(60") summer rainfall.

Naturally Foods
PO Box 987, 200 Thompson Rd.
Avon, CT 06001
(203) 673-2300

Louie M. Oliveras
PO Box 2812
Gardena, CA 90247-1012
(310) 532-1177
See iodine isotopes as cause of AIDS (radiation disease, USSR, iodine via thyroids of all mammals.)

Richard Pack
PO Box 320
Milford, DE 19963
Interested in promoting use of dust from quartz quarry, and can supply.

Don Payne
PO Box 71130
Ocala, FL 32671
(719) 282-9604
Student of Cayce and A.R.E. Desire to obtain small farm in "safety lands" of IL, IN or OH, join w/ others active in org farming and research. Esp. interested in networking Cayce readings and Rudolph Steiner methods.

Dr. M.P. Pimbert
Principal Entomologist
Legumes Program
ICRISAT Patancheru P.O.
Andrha Pradesh 502324, India
Current research on SR and legumes.

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(305) 431-7523
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Samuel Ready
232 Wooten Drive
Walnut Creek, CA 94596
(510) 938-3454
Interested in rock dust distribution business.

Marian Rose
214 South Main St.
Brattleboro, VT 05301
Gardening (Findhorn and Perelandra style) and would like to pursue SR. Some experience with SR in India.

Marien Schmidt
56 Tamarack
Whitehorse, Yukon Territory
Canada Y1A 4Y6

John Schrack
R.D. 1 Box 1529
Hamburg, PA 19526
(215) 488-6306
Dairy farmer and raising ducks on contract Interested in others results in rock dust for cows and ducks and exp. with SR.

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(916) 553-2219
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San Francisco, CA 94122

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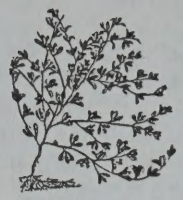
Accumulator Species

by Dan Hemenway



Gary Schneider raises a pertinent question in the *Letters and Forum* section of this issue (see page 45). There is not a lot of good information pulled together on accumulator plants. For example, Bill Mollison's fairly comprehensive *Permaculture Designers' Manual* does not even list the topic in the index and I was able to find no mention of this important topic in the treatment on soils.

The best single source of which I know is *Designing and Maintaining Your Edible Landscape Naturally* by Robert Kourik, a book which we at Yankee Permaculture distribute because of outstanding treatment on a number of such important topics. (US $22 ppd in the US and US $24 elsewhere.) Kourik devotes a short but fact-filled chapter (pp 265-271) on fixers and accumulators.

Otherwise, information on accumulators pops up in the literature from time to time. The best single source of such tidbits, in my opinion, is *HortIdeas* (Rt. 1 Box 302, Gravel Switch KY 40328).

My own publication, *The International Permaculture Solutions Journal,* is looking for a volunteer to put together a well researched piece on accumulators.

As I frequently point out on these pages, it is important not to take a mechanistic viewpoint on accumulators. Some accumulators concentrate scarce supplies of a useful mineral (e.g. calcium.) However this activity may be dependent on mycorrhizal fungi which have a specific association with the plant roots, (or it might not). And it matters whether the mineral is accumulated principally in the perennial portion of a plant (e.g. roots or woody tissue), leaves that are shed annually (e.g. calcium in oak or sugar maple leaves), in the bark (which may or may not be shed as the tree grows), etc. Eastern red cedar (*Juniperus virginiana*) is said to accumulate calcium (and probably other minerals) in its needle litter, however goats and deer, which selectively browse mineral rich vegetation, like to strip the bark from red cedar, suggesting that perhaps the cambium is rich in such minerals also. (Red cedar thrives in particularly degraded soils and tolerates extremes of pH.) White "Dutch" clover (*Trifolium repens)* fixes nitrogen, a somewhat different matter, and also is known to be a phosphorous accumulator, apparently being to release soil phosphorous in "unavailable" chemical forms in the soil. Browsing (or presumably mowing) stimulates nitrogen fixation in the clover. Does it stimulate phosphorous accumulation? I'd guess "yes" because the increased nitrogen serves to increase regrowth, but clover cannot produce phosphorous-deficient tissue, so increased phosphorous is needed for regrowth as well.

The purpose to my rambling is to stress that accumulation can be a function of the *ecosystem* at large, not merely a mechanical result of introducing a plant without its microbial, algal and fungal associates, without regard to the plant's experience. Furthermore, release of nutrients is known to vary with soil pH, aerobic or anaerobic conditions, etc. These matters can be virtually products of the ecosystem as a whole. And they can and do vary substantially in the same soil depending on depth, proximity of certain plants, slope, microclimate, and pulses of certain gases, such as ethelyne, in the soil.

The difficulty of attempting restoration of a self-feeding ecosystem in forests of the northeast is that the environment has become so degraded that understory species may be lost. Typically the duff on the forest floor is degraded or gone and instead of a spongy surface with profound buffering capacity and all sorts of little understory plants and animals we find a pavement-like surface, or worse, actual grass growing. (Generally, grass isn't good for trees.) Some understory species, such as flowering dogwood (*Cornus florida*) are known to accumulate minerals. (*C. florida* is now severely threatened with a disease which may be associated with forest decline.) These minerals are deposited on the forest floor where feeder roots of other forest plants, including the overstory trees, have access to the mineral "brought up" (if that is indeed what happens). A lot of understory trees are cut from forests as "weed" trees and of course crown break and disintegration of the duff destroy habitat for understory plants. Also, as decline reduces the leaf products of the overstory trees, *their* contribution to the complex of minerals is lost, particularly as this is often a symptom of the death of mycorrhizal fungi which specialize in release of minerals.

The mycorrhizae themselves often release nutrients in a way that all of the root hairs in the vicinity, not merely those of the plant with which it associates, can absorb the previously "unavailable" mineral. Possibly analysis of the tissue of the symbiont tree (or shrub, herb, etc.) would not suggest "accumulation" but the minerals the fungi associated with this species releases might be available in much less quantity if the "host" plant were not present.

While species within the ecosystem do cycle minerals to the enrichment of the ecosystem as a whole, there are also apparently "mineral wars" between some groups of plants. For example, conifers sequester minerals, particularly potassium and perhaps phosphorous and some trace minerals, in their *woody tissue,* where not only is it unavailable to broadleaf plants which might shade out the conifer, but also unavailable to the living portion of the conifer itself. My guess is that it needs less potassium (etc.) than broadleafs and uses this as part of its strategy to suppress broadleaf growth through the conifers which could pose serious or fatal competition. The way this fits with overall strategy is fascinating, but I'll spare your printers' bill. Broadleaf trees generally (and remember Nature contradicts all her generalizations) sequester calcium in *their* woody tissue. Possibly this denies essential nutrient to the conifer (or, for example, the mycorrhizal fungi upon which it depends). So when we remineralize a wild forest we will absolutely change the relative abundance of species, particularly in terms of biomass, because some species will be more liberated by the fresh mineral than others, which were better able to compete in a condition of nutrient scarcity. And, for reasons I haven't even a guess about, the bark of most tree species is regarded to have accumulated phosphorous and some trace minerals. (Bark, like wood, is dead tissue.) And of course when we pull wood from the forest, we pull minerals, which will vary on the species we are harvesting. Since we observe that monocultures of, say, yellow pine which are clear cut and repeatedly replanted, show rapid reduction of growth and final size from one generation to the next. It may be, Chris Maser's excellent work on woody debris in forest ecosystems might suggest, that the trees store in their wood the fertilizer to grow the next generation of their own kind.

We need to mess around with these systems with a great deal of restraint and humility.

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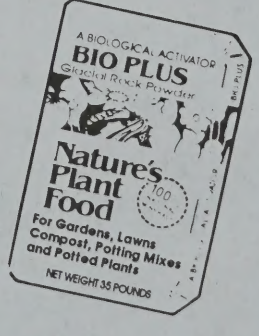
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